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ABSTRACT

Three tests were developed in the Canadore Comprehensive Achievement Monitoring (CAM) project in the area of mathematics. The Canadore CAM Monitoring Tests were used to obtain an estimate of knowledge of objectives on a preinstruction, postinstruction and retention basis. The Math Survey Tests were used to place a student at the appropriate point within the math curriculum. The Math Block Mastery Tests were developed to allow for a pretest, posttest and interim test within each study block. In order to construct these tests, content topics were identified, then further defined by curriculum level. Since in an individualized program, it is necessary for some sort of objectives to be written so that students can ascertain the immediate goal of their study, Generic Objectives were developed for each content topic at each curriculum level. Each Generic Objective indicates the stimulus, how the information is received by the student, the general operation and the component operated on, and the output expected from the student. Five test items were written for each of the Generic Objectives. For each kind of test, items were randomly selected to cover the appropriate Generic Objectives. (BW)

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CANADORE COMPREHENSIVE ACHIEVEMENT MONITORING (CAM) MATHEMATICS: AN INTRODUCTION & OVERVIEW

Learner at the Centre:
A Project in the Management of Instruction

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CURRICULUM AREA

For the purposes of the project it was decided that attention would be placed on mathematics as the subject area for this initial portion of the Canadore CAM System. Only a single curriculum area was chosen so as to concentrate developmental tasks in one direction.

It is obvious that mathematics is a vital and basic skill area for many occupational trades. Because of the strong hierarchical and sequential nature of the discipline, the obtaining of accurate data on student learning outcomes and retention is vital both for the student and the program. The CAM Model, as explained in the ensuing pages, is ideally suited to the task. There were four possible curriculum areas that could have been chosen: communications, science, mathematics and reading. The science and communication areas were allocated to another part of the project - cognitive style mapping. It would have been unwise to further confound that investigation by incorporating a new curricular organization and management system.

Further, a CAM System in reading for students in a group-paced setting has been developed in New York State. It was thought to be more beneficial to embark on a different curricular discipline than just to revise a CAM Model for reading so as to fit into an individualized setting.

CONTENT TOPICS

After deciding on the curricular area, the general topics to be utilized were determined. The LINC Mathematics Program, in use at the time, in the BTSD Program at Canadore was consulted as were other materials (such as text books and course outlines) that are usually employed by the mathematics instructors.

After these series of analyses were accomplished, it was decided to form 19 topic areas. They were to be tentative and subject to change as conditions altered. The content topics enumerated were:

Whole Numbers
Fractions
Decimals
Percent
Measurement
Sets
Geometry
Integers
Ratio and Proportion
Trigonometry
Algebra
Indices
Graphs and Statistics
Slide Rule
Logs
Series and Progressions
Permulations and Combinations
Consumer Mathematics
Metric System

These topics included every unit that is usually taught to the students from the lowest grade to the highest (i.e. grades one through twelve). The topic outline was designed to be complete for the entire BTSD mathematics curriculum.

CURRICULUM LEVELS

In the BTSD Program, students enter with varying achievement levels in mathematics and indeed, in all content areas. A student might enter with, in effect, no knowledge and/or training in arithmetic (at the Kindergarten or Grade "O" level) or with most mathematics skills learned except for a selected few (i.e. use of a slide rule). As a result, it was decided to include all grade levels from K to 12 for the final version of the Canadore CAM-Math System.

However, it was preferred that these grade levels (13 in all) be grouped together to make a more manageable number of curriculum levels. Of course, these grades could be grouped in any number of different combinations to make as many or as few levels as desired.

After discussions, it was determined that the lower grades of the traditional school system (i.e. K-8) could be more conveniently grouped than the traditional high school levels since much of the material is usually reinforced from grade to grade at these earliest levels. Also, the topics are more consistent from grade to grade in K-8 than 9-12 where many new topics are actually initiated and then concentratedly reinforced.

Curriculum levels for the Canadore CAM System-Mathematics are as follows:

Curriculum Levels	Grade Levels
I	K-3
II	4-6
III	7-8
IV	9
V	10
VI	11
VII	12

TOPICS BY CURRICULUM-LEVELS-MATRIX

The two aspects-content topics and curriculum levels-were combined into a matrix of 7 columns by 19 rows that consisted of 133 cells. As a result, there were 133 decisions to be made as each cell represented a given content topic in a specific curriculum level. In effect, for each cell, a decision had to be made as to whether at least a portion of the specific content topic ought to be taught in the given curriculum level.

A two-level format was developed to be used to indicate teaching within a cell. A solid line (————) in a cell was used to indicate that this topic was taught with emphasis at this level. A broken line (-----) was used to indicate that some attention was given the topic but only briefly or in an introductory or peripheral manner. It was further determined that the teaching with emphasis for a topic would occur in contiguous cells (horizontally) if it occurred at more than one curriculum level. Information from various inputs was used in order to classify each cell. The experience of the mathematics instructional staff in combination with current mathematics material (i.e. LINC) were relied on most specifically in this classificatory procedure.

The resulting completed matrix is given in Appendix D-1. In this matrix, for example, it can be seen that the topic of "whole numbers" is taught primarily in curriculum level I and II with peripheral attention given in the third and fourth levels. Decimals, on the other hand, is taught peripherally in levels I and II, with concentration in level III and reinforcement in levels IV and V.

This matrix has become the curriculum basis for the Canadore CAM-Math System. The subsequent organizational structure will always be able to trace its roots back to this matrix.

SUBDIVISION OF TOPICS INTO STRATA

Once the basic 19 general topic areas had been determined, it was necessary to subdivide them into smaller units. A three-tier approach in this breakdown of the content topics was developed. That is, there would be a general topic subdivided into subtopics and, if necessary, further broken down into subsubtopics. It was also realized that in some circumstances two levels would be sufficient and this was to be acceptable.

Inputs were obtained from numerous sources in order to achieve this subdivision. Again, content outlines, current texts, Humber's RANDA Program and our existing mathematics programs were all employed. This data was further refined by utilizing the experience of the instructional faculty at Canadore.

Originally, a rough division into subtopics was achieved. A subtopic was to be included if it was found in a content outline and if in the instructional staff's opinion it ought to be taught to students in this program once they had attained the appropriate prior learning experiences.

Once this original subdivision had been accomplished, an additional sub-level was obtained by subdividing the second-tier topics. Again, the same sort of analysis was used as for the original breakdown. However, this time, much more attention was placed on whether specific content areas should be taught to students in a BTSD Program. The assumption here was that only the content areas that ought to be taught should be included in the outline, at least in the preliminary version.

This "Revised Draft" of the content outline is listed in Appendix D-2. It is not designed to be a final format. The whole concept in our system's design is that formative evaluation will be utilized to the utmost. It is hoped that continuous feedback of all types will allow constant upgrading of the topic outline as well as all other portions of the Canadore CAM-Math System.

UTILIZING PUBLISHED OBJECTIVES

Math objectives have been written for numerous courses, books and instructional systems. There are a wide variety available from numerous sources. In fact, some published objectives are very comprehensive and, in a general way, applicable in any BTSD Program.

It was decided to obtain a reference file of mathematics objectives from selected sources. This file was firstly to be used as an idea generator in as far as writing objectives was concerned. However, even more important was its use as a check to ensure that important, perhaps intermediary, objectives were not excluded.

Objectives from four sources were deemed relevant enough to be included in this reference file. Most directly applicable were those that were at that time in use at Canadore-those of the LINC (Learning Individualized for Canadians) Program.

This was thought to be a good base on which to build the reference file. In addition, the forebearer of LINC, the NewStart objectives, were thought to be a useful supplement. Although they overlapped considerably, together they represented most content subtopics.

An additional group of mathematics objectives were obtained from Project SPPED-System for Pupil and Program Evaluation and Development. This group of objectives, covering grades K through 9, was organized by level and topic and grouped into a "bank" (or collection) of objectives. In addition the packages prepared by Humber's RANDA Division were useful. Every stated objective of these three programs was cut-out from the original document and pasted onto a 5 by 8 inch index file card. Then each card was sorted, based on the previously obtained strata of objectives. The result was well over one thousand objectives sorted by topics and subtopics.

Of course there were very many cases in which virtually identical objectives were obtained in the same subtopic area. In addition, nearly all of the objectives were far too specific to suit the purpose of the Canadore CAM-Math System. Nevertheless, these did help greatly in forming the genesis of our objectives.

GENERIC OBJECTIVES

The basic element in the CAM System is the "generic objective" (GO). It was found that many of the objectives developed by others were far too specific, or even too general for this curriculum development. Partially in order to lessen the instructor's load in the preparation of these objectives, it was thought that objectives could be written that neglected specific content in favor of an overall objective. This could be made more specific later when the GO and specific content were mapped together to produce content objectives.

A defined form of the generic objective was developed. A specific format was utilized in order to ease the problems of writing the objectives and, more importantly, applying them in practice.

Our generic form of objectives can be broken into an input and an output string. An example of a possible mathematics generic objective is:

Given a $\overset{1}{\boxed{\text{whole and decimal number}}}$ $\overset{2}{\boxed{\text{orally,}}}$

Input String

the student $\overset{3}{\boxed{\text{writes}}}$ the $\overset{5}{\boxed{\text{whole}}}\overset{4}{\boxed{\text{number}}}$

Output String

The input string indentifies the general type of stimulus or stimuli (1) and the general mode of input (2) in the math objectives. The usual mode of stimulus is visual - the student reads what he is given. So common is this that it was decided to state that the mode of input (2) will only be listed where it is not written or visual. Every other mode was to be an exception and therefore to be specifically stated, as in the above example.

The output string consists of the general operation or behavioral indicator or verb (3), the thing operated on or component (4) and any necessary modifiers (5). The behavioral indicator (3) is the action verb that indicates what the student is to do - write, solve, calculate and so on. A modifier (5) is only utilized when it is considered necessary to further describe the component.

From the explanation and example given, it is clear that this particular form of objective initially disregards specific content (for further explanation, see Appendix D-3). In this system, specific content is employed only when allocating Generic Objectives to horizontal sequences of cells in the Content Topics by Curriculum-Levels-Matrix.

CONSTRUCTING THE GENERIC OBJECTIVES

The basis for constructing the generic objectives was the strata of objectives that analyzed the 19 topics into a three tier system. As this had been constructed with considerable care, the writing of the generic objectives was made less onerous than would have been the case without this detailed outline.

Every Generic Objective was written in the format indicated above: "Given ...., the student ...."

As each Generic Objective was written, it was independently checked as to the validity of the content and the general clarity of the objective itself. It then went back to the initiator of the generic objective for his re-assessment.

At that point, the generic objective (written on a printed card) was preliminarily approved and given a temporary generic objective content number that consisted of eight digits and corresponded to the six digit code developed for the strata of objectives plus two digits for the objective number. Then the objective was sent to be typed in the appropriate places on a previously designed draft version of a Generic Objective card (for further explanation, see Appendix D-4). The objective, objective number and classification were typed on the card. The procedure then called for the initiator and an instructor to approve the objective to their satisfaction. The objective was then sent to the Evaluator for final analysis. It was his duty to approve the overall content and style of the objective. More importantly, he utilized the previously developed objective Reference File for comparative analysis. Care was taken to prevent important objectives from not being included in the Canadore CAM-Math System.

This procedure was followed for every generic objective so that, eventually, a paper-based data bank of generic objectives was obtained. A list of some of our generic objectives is given in Appendix D-5. However, it must be kept in mind that this is not a static collection. Any individual Generic Objective may be altered if necessary. In addition, entirely new objectives or groups of objectives can be initiated if later feedback and analysis indicates the advisability of this action.

Generic objectives were written for all the content topics of relevance to the K-10 grades: Levels 1 to 5. It had been decided a priori to confine the original course domain to the first five levels. Correspondingly Generic Objectives were written for only those sub-topics in levels 1-5 as indicated in the content topics by curriculum levels matrix.

SEQUENCING OBJECTIVES BETWEEN CURRICULUM LEVELS

When all the necessary Generic Objectives had been written and passed final approval, it was necessary to assign each objective to a specific level or levels. The process started with a look at the objectives in the whole number classification. Each objective was reviewed as to which level it should be in, taking into account the matrix as illustrated in Appendix D-1. When it was determined at which approximate level the objective belonged, it was time for a different evaluation.

Each objective was reviewed as to the utility or necessity of teaching it at two or more levels. The general approach was to consider if the objective was important enough to be introduced at one level and then re-taught at a higher level. There were two classifications for re-teaching: "re-cycle" where the objective was re-taught at a higher level of difficulty and "review" where the objective was re-taught at the same level of difficulty as the previous level.

Generally "level of difficulty" was synonymous with different content parameters. Where one level of difficulty might be adding one and two digit numbers, the next higher level might deal with three or more digit numbers. In virtually all cases where an objective was introduced in one level and re-cycled in another level, the difference was in the specific content parameters on the Generic Objectives. These content parameters further defined the item-form type of objective we were writing.

In the case where an objective was introduced and then reviewed at a later level, the content parameters were identical, often not being mentioned, at least in as great a detail as in the previous case.

Accordingly, all objectives were reviewed as to the following:

1) Choose "introduction" level.
2) Decide if phasing to be done in two or more levels.
3) Decide whether post-introduction levels to be described as "re-cycle" or "review".
4) Decide level of difficulty parameter if more than one level and objective is re-cycled.

These decisions were made and reviewed several times before the final Levelling phases were determined. The final approval and arrangement was determined by the CAM Evaluator.

As a result of these analyses, some 1004 Generic Objectives were developed, some of which were in two or more Curriculum levels at one or more levels of difficulty. The distribution of the Generic objectives in the content topic by curriculum levels matrix was as is shown in Appendix D-6.

Note that the total number of objectives is at a maximum in Levels II and III and at a minimum in Level I where greater attention is paid to fewer numbers of objectives.

SEQUENCING OBJECTIVES WITHIN CURRICULUM LEVELS

Now that the objectives that were to be included in each level were chosen, it was necessary to order the objectives within each level into an instructional sequence. That is one had to decide what objective was to be taught first, second, third...in each level. In what order was the typical student to receive instruction on objectives.

It was decided to utilize a block organization for our curriculum. Each level was to consist of Blocks of instruction. Each Block was to a priori be defined as a section of content taking the average student about 20 hours to learn. As our program is individualized, the determination of 20 hours worth of instruction was difficult. However, as long as there was the tendency to make each block roughly equal in length of time taken to learn the material, this was satisfactory. There were to be no more than 19 blocks of instruction in each level. For our five levels, the following illustrates the numerical schema.

Level	Allowable Blocks
1	01-19
2	20-39
3	40-59
4	60-79
5	80-99

Within each block were units and within each unit were modules or objectives. The make-up of each unit was formed on the basis of homogenous content. There were to be no more than 9 units in a block and no more than 9 modules in a unit -- forming a maximum of 81 allowable modules per block.

For each level, the first step was to roughly order the topic areas to be covered in a level according to logical instructional sequence. After this rough ordering, specific Generic Objectives were put into order. This order was checked at least twice with final approval being given by the CAM Evaluator.

After the instructional sequence was determined on the basis of Generic Objectives, it was time to put the objectives into the administrative schema. The objectives were first grouped into units of instruction, the main consideration being homogeneity of content and the stipulation that the maximum number of objectives per unit would be 9 with the mean to be considerably less than that-hopefully around 5 or 6 modules per objective. This requirement was needed to keep the units reasonably short and to allow for additional objectives in a unit if this became desirable in a later curriculum revision.

During formulation of these units, there were some alterations and revisions to the sequence of instruction previously chosen. This came about for pedagogical and administrative reasons. However, these changes, especially for the latter reason, were kept to an absolute minimum.

Once the units for each block were determined and were in the recommended sequence, the units were grouped into blocks. Each block was to contain the above mentioned 20 hours of instruction for the average student as well as being restricted to 9 units or less. This process was followed for all five levels. As a result, the following indicates the actual block numbers in each level:

Curriculum Level	Blocks
1	01-07
2	20-33
3	40-55
4	60-71
5	80-88

The administrative numbering structure differed from that of the content classification scheme, there being 4 digits in the administration number. The meaning of the digits is explained below:

$$\overbrace{2 \qquad 1}^{\text{block no.}} \qquad \underset{\text{unit no.}}{\underset{\downarrow}{3}} \qquad \overset{\text{module no.}}{\overset{\uparrow}{4}}$$

The scheme was restricted to 4 digits because of the CAM computer program that was to be utilized. However, the Block number indicated which level it was in because of the non-repetitive block numbering sequence.

At this point, there existed the entire administrative structure with all objectives grouped and in the desired instructional sequence. In abbreviated form, the outline of the Generic Objectives by Level, block and unit is given in Appendix D-7.

Now the attention needed to be turned to assessment.

SELECTING TEST ITEM FORMAT

The objectives were written in Generic format, for one reason because it is an item-form type of objective. That is to say, it explicitly states the information to be given the student in assessing his knowledge as well as indicating the desired output he should produce. Our objectives are much more explicit in regards to parameters such as these than most other objectives.

In addition, it was known that we would utilize the CAM computer program to analyze performance. This program allows for direct input of student responses to a test. The most efficient means is to have objective type items (True-False, Matching, Multiple Choice). The use of these types of test items eliminates the need for direct involvement by any teacher or clerical aid. Also, since we are dealing with a mastery situation it was thought extremely unlikely that a person could obtain 80% or so just by guessing. Furthermore, multiple-choice test items are recognized for their sensitiveness as test questions. Minor fluctuations in knowledge can be detected by these types of tests, a change more difficult to assess and quantify in short-answer (recall) or essay tests.

Finally, if the distractors are constructed and chosen with care, there exists a powerful diagnostic device capable of informing the intelligent evaluator and instructor about the types of mistakes being made by a student and the specific instruction he should receive. It is the ideal beginning of a truly effective CMI system.

Correspondingly, it was decided to employ multiple choice questions for virtually all objectives (there were a very few exceptions). It was additionally determined to make five response options available to the student. This number was chosen for a variety of reasons: maximum number of options permitted by CAM, lowest chance score and on the average more diagnostic possibilities. Of the five options, the fifth was virtually always to be of the "correct answer not given" or "none of these is correct" sort. Having this non-numerical option in a content area that is usually either of the right or wrong answer variety would hopefully tend to reduce chance scores somewhat. In any event, it was decided to make this fifth option the correct answer on 20% of the population of test items. Indeed it was determined that each objective was to have 5 test items written for it. These 5 test items for an objective would have the correct answer 1, 2, 3, 4 and 5. Thus in the population of test items for an objective, or for groups of objectives, the distribution of correct answers would follow a rectangular distribution (all answers equally likely). On a sample of test items, there would exist a tendency to form a rectangular distribution, deviating from the true distribution being due to random fluctuations due to sampling.

CONSTRUCTING TEST ITEMS

Once the test item parameters were determined, the test items needed to be written. The goal was to write five test items for each of the 1,000 plus objectives - a total of over 5,000 test items. The task was very awesome but possible - but with much effort! Because the objectives were written in Generic format, the job was made very much easier. In general, the objective was very specific as to the required elements of the test item.

Item writers were selected to write the test items under the direction and control of the CAM Evaluator. Very specific instructions were given to each test item writer. Initially, the CAM Evaluator wrote what were termed "proto-type test items". This consisted, in fact, of one sample test item for each objective. The test item writers then were to follow the format, in general just changing the specific content numbers and such like.

The test item writers then wrote the remaining four test items for the objectives that had proto-type items written. The CAM Evaluator then very carefully checked the test items for specificity, correct answer, desirability of distractors and so on. Those not passing scrutiny were passed back to the item writer for revision. The CAM Evaluator had final approval on all test items.

As the item writers became more experienced, they wrote proto-type test items for those objectives not having this sample item completed. Every proto-type was thoroughly checked and revisions made as needed. It was only after the proto-types were written and approved that the remaining four test items were constructed.

Even after all the test items had been constructed, the CAM Evaluator and others reviewed the test items to ensure face validity and accuracy of the test items.

It had been decided to type all test items on 5" x 8" cards. After much deliberation, the final design chosen was as is illustrated in Appendix D-8. The upper half is the front of the card and the lower half is the back of the card. The card itself was printed on yellow stock.

The test items were typed onto the card, following a very rigid spacing guide (See Appendix D-9). It was necessary to ensure all test items were typed following this guide because of the method of constructing tests to be employed.

Sample test items are shown in Appendix D-10. Notice that there are three formats for displaying the five options. The decision as to the specific arrangement to use for any one test item depended on the length of the longest response option. The goal was always to reduce vertical length without sacrificing clarity of the response options.

All 5,000 plus test items were typed on the test item card, front and back, each objective having 5 items written for it. As previously indicated, for any objective the correct responses were 1, 2, 3, 4 and 5 respectively for the five test items.

The test items were numbered using the four digit administrative code plus 2 digits for the test item. All test items were given numbers from 01 to 05 to correspond with the correct response of the test item. One can notice from the samples, that the single digit preceeding the block number indicates the level. Although, strictly speaking, this number is redundant and cannot be used in the CAM computer program (for space reasons) it is useful when looking at the test items (and Generic Objective) cards.

Each of the test items was checked again after typing to ascertain any typographical errors that might exist. In that way, virtually all of these typing errors were corrected. As a last check at this stage, a check was made to ensure that the correct answer indicated was, in fact, the correct answer and that there was only one correct answer among the five options. Finally, a review was made by the CAM Evaluator to check on any anomalies that might exist. At this point, it is generally the procedure to "try-out" the test items on a sample of students to pick up any "bugs" that might exist as well as to obtain a rough estimate of the efficiency of the distractors. For some selected test items this normal procedure was followed. However, the ratio of number of test items to students was so large and the students spread so thinly throughout the levels that this normal procedure was discarded as impractical. Nevertheless, as many checks and reviews as possible were made (taking into account the limited funds available).

SELECTING TEST TYPES

During the process of selecting the test item types, a parallel procedure was being pursued. The entire evaluation scheme was in the process of being established. After much discussion and thought, it was finally decided to employ a system utilizing three types of tests. The first test-type to be developed was to be called Canadore CAM: Math Monitoring Tests. These series of tests were to be designed to monitor pre-instruction, postinstruction and retention knowledge on a large group of objectives. The prime purpose of these tests was to serve as a method of obtaining extremely useful data (especially pre-instruction and retention) for the purposes of curriculum analysis and revision. However, they were also to serve as a review of objectives previously studied on the part of students.

The second set of tests to be developed was the Canadore CAM: Math Survey Tests. These series of tests were to be administered to an incoming student. Any student was to take this series only once - when he entered. Essentially they were to be designed to approximately place the student in the curriculum. Assuming some knowledge of mathematics, at what point in the curriculum should the student start? At what block should he commence his instruction?

The last in the series of tests was the Canadore CAM: Math Block Mastery Tests. These tests were to be designed to assess mastery of the set of objectives in a block. A test would be given upon entry to a block to ascertain what objectives, if any, the student needed to study-those on which he apparently lacked adequate knowledge.

After instruction, the student would be given an equivalent form of the mastery test for that block to determine his mastery of the objectives. To pass out of the block, he needed to obtain 80% correct on a block mastery test.

CONSTRUCTING ALL CAM TESTS

It was decided that no test would exceed 30 test items in length, with the desirable maximum being about 25. No test was to be so long as to increase normal student fatigue to an undesirable level.

The tests were to be answered on separate answer sheets. Two types of answer sheets were to be available: mark sense cards and 3M test score sheets. The final destination of the student's answer to a test was to be the computer. Correspondingly, the mark sense cards needed to be read and Hollerith codes punched. The 3M sheets needed to be key-punched.

The tests were to be constructed by selecting the test item numbers to be used in a test. Then, the item cards were pulled out of the paper-based data bank. The cards then were put in the required order and placed in acetate folders. Required headings, instructions, test item numbers, etc. were also placed in the appropriate places in the acetate folder. These folders then were transformed into offset masters and lastly, the test sheets were reproduced and sheets collated to form a test form.

As can be seen, no typing of test items was to be required, a saving in time and accuracy of the reproduction of the test items.

CANADORE CAM MONITORING TESTS

The first set of tests to be constructed were the Canadore CAM Monitoring Tests. The purpose of these tests was to obtain an estimate of knowledge of objectives on a pre-instruction, post-instruction and retention basis.

It was decided to develop a series of Monitoring Tests for each level. The student was to be given a Monitoring Test in the level in which he was currently studying. After much deliberation, a maximum of about 50 Generic Objectives in each level were selected and designated "Monitoring" Objectives. These were objectives thought to be so important, for whatever reason, that it was advisable that close "tabs" be kept on students' performance on these specific objectives.

The decision on "about 50" as a maximum was mainly based on practical considerations. It was obvious that, considering the size of our student body, we could not monitor all objectives. Thus a subset had to be chosen from each level. As each test form had an a priori maximum of 25 test items, 50 objectives meant that there would be two completely different sets of objectives in each level. In order to obtain reliable data rather quickly, this was thought to be a practical upper limit to the number of sets of monitoring objectives in a level.

After a rather exhaustive review, the following indicates the number of generic objectives chosen to be monitoring objectives in each level:

	Number of	
Level	Monitoring Objectives	Total Objectives
1	20	71
2	51	301
3	53	300

Level	Number of Monitoring Objectives	Total Objectives
4	48	185
5	38	147

After the Monitoring Objectives had been selected, it was necessary to obtain two sets of the objectives to form the basis for the two sets of test forms in each level. The sampling of the objectives (into set 1 or set 2) was on a rather deliberate basis. The attempt was to ensure that each block was about equally represented in each set. Levels 1, 4 and 5 had 10, 24 and 19 objectives in each set while Level 2 had 26 and 25 and Level 3 had 27 and 26 objectives in each set.

For both sets of objectives in each level, five test forms were constructed. The test items for each objective were randomly assigned to the five equivalent test forms of the set. When all test items had been assigned, the order of the administration of test items on a particular test form was randomly determined.

Correspondingly, although the selection of the Monitoring objectives and the breakdown of these into two sets in each level was deliberate, the assignment of test items to test forms for all objectives and the ordering of assigned test items in each test form was randomly determined.

After all the test forms were formulated on paper, the actual test forms were constructed following the procedure indicated above.

CANADORE CAM: MATH SURVEY TESTS

When a student enters the program it is necessary to place him at a specific point in the Math Curriculum. To that end, the survey tests were developed.

As a starting point, the two sets of objectives in the Monitoring Tests were collated and a level survey test constructed on the basis of all Monitoring Objectives.

There were five forms of each survey test (5 test forms per level). The test items and arrangements of test items in the test form were randomly chosen.

In the program, an entering student would take the survey test considered appropriate for a student with his background. If he reached 80% criteria on the survey test, he then would take a survey test in the next higher level. He would take survey tests until his performance fell below 80%. At that point, he would take a Block Mastery Test in the first block of that level to see if he needed any instruction in that particular block (see below).

Correspondingly, the survey tests were to be used as rough screening device to ascertain at which level a student should commence instruction.

CANADORE CAM: MATH BLOCK MASTERY TESTS

In our individualized approach, students are in a mastery learning situation. Correspondingly, Block Mastery tests needed to be constructed for each block of instruction.

It was a priori decided to generate three equivalent test forms for each block. This was to allow for a pretest, posttest and interim test while studying in the block. At a later time, when more test items were written, additional Block Mastery Tests would be constructed for each block.

The specific number of test items chosen per pbjective depended on the number of objectives in the block, taking into account the desired maximum of 25 test items per test form. In all but the largest blocks, at least one test item was randomly selected for each objective. In these extra long blocks (in terms of objectives) not all objectives were tested in at least two of the three test forms in the block:

The specific test items selected for a particular test form were randomly chosen. In addition, the arrangement of test items on any one test form was also random. Thus on any set of test forms in a block, the test items were randomly selected and no test form had the same pattern or order of the objectives. No test item was selected for two forms unless, because of the test selection rules for that block, it was necessary (for example, if two test items needed to be selected for each objective in a block, one test item was repeated, but never on the same test form).

In this way, every block had three (seemingly) equivalent block mastery tests - making a total of 174 of these tests, three for each of the existing 58 blocks.

CAM COMPUTER PROGRAM

The Comprehensive Achievement Monitoring system computer program (CAM3) was selected to be the vehicle to record and analyze the student achievement data. This program was selcted after much deliberation and anasynthesis. As the computer at Canadore (Honeywell Series 200, Model 115) has too small a core capacity to accept the CAM3 program, it was decided to load it on a computer at another community college. After extensive negotiations were completed, Humber College was chosen to have the CAM program installed - at no charge to Humber. This program would have the data inputted and stored and would output the reports that were required at that time from the more than 50 reports that are available. This program would be the source of all the special reports of great use to the students, staff and administration. However, as Humber's computer was 200 miles away, as some tests (Block Mastery) needed to be scored and reports sent back overnight and as no computer terminal facilities were available, it was thought advisable to have a means of scoring the students' tests with at most, overnight turn around. As a result and after discussion and analysis of alternatives, it was thought best to design a computer program that could be used at Canadore to score the tests. Correspondingly, a computer program was designed and was to be installed on the Honeywell machine at Canadore. This program was designed only to score the tests and output the individual student report. All the data would again have to be inputted into Humber so as to allow that information to enter into the analysis algorithms of CAM. At a later date, it is hoped to have direct terminal access to the full CAM program thereby eliminating the dual inputting required as of now. This will allow for much greater efficiency.

PREPARING COMPUTER INPUT

To prepare data to enter the CAM3 program there exists a series of manuals, including:

CAM3 User's Manual
CAM3 CANAL User's Manual
CAM3 SREP User's Manual
CAM3 PRCOD User's Manual

These manuals along with practice exercises give the basic information needed to prepare data for input. In addition, it is helpful to have someone experienced in this area, to be of assistance in this process.

CANADORE CAM REPORTS

The information given in Appendix D-11 gives a short summary of the types of reports available to a CAM3 user. A careful analysis of this gives the neonate some valuable tips on what type of analysis can be performed.

The regular reports available on each run are the Individual Student Report, Test Form Analysis Report, Teacher Roster Test and Group Summary Report. The other reports are available on request and are generally run on a rather infrequent basis.

ADMINISTERING CANADORE CAM: MATH MONITORING TESTS

Each student is to be given a test form, randomly chosen from the population of 10 available from the level in which he is taking instruction. He will never be given a test form which he has taken previously as it is almost impossible for him to remain in the same level for more than 10 test administrations.

The tests are initially to be administered on a monthly basis approximately the third Tuesday in each month. After complete implementation of Canadore CAM: Math in all its aspects, more frequent administrations, probably bi-monthly, could be undertaken. All students are to be scheduled to take the test the same day. Those absent or who do not attend on the first day are to be requested to take the test the next day. Those who still do not attend will be asked to do so on a third day through their faculty advisor.

In this way, almost 100% of students will take the test in a given test administration.

STUDENT MANAGEMENT FOLDERS

If a student is required to study in a block, he needs to know three pieces of information:

1) the objectives in the block, along with their administrative numbers.
2) the objectives he needs to study in the block.
3) resources from which the student can study in order to learn the objectives.

For any block, a list of generic objectives exists. However, these objectives were needlessly complex for students to have the gist of what the objective was about. Correspondlingly, every objective was simplified and usually shortened. This laborous process involved an original revision, a review, secondary revision, review and so on, until the alteration was acceptable. Next, a form was designed on which to type the objective.

Each revised student objective in a block was typed onto the "Mathematic Task Index Sheet". The format and sample sheets are as shown in Appendix D-12. The triad of squares at the right - by each unit - reserves a place for the student to place the month, day and year he completed instruction on the unit. When a student is told which objective number he needs to study as determined on the basis of the pre-test in the block, he can tell with what the objective deals.

In companion with the task index were designed a series of Resources sheets - one each for Print Material, Films and Video-cassettes, Audio Tapes and Filmstrips.

For each unit of each block, a committee scoured the available resources to indicate in what book, tape, filmstrip etc. a student could find instruction on a given unit. This process consumed many weeks as a thorough search was made so as to generate as many resource references as possible for each unit. As a result there finally existed the task and resource sheets for each block in our course.

With these the student would have a valuable tool with which to guide his studies in a block. The format and sample sheets are shown in Appendix D-12.

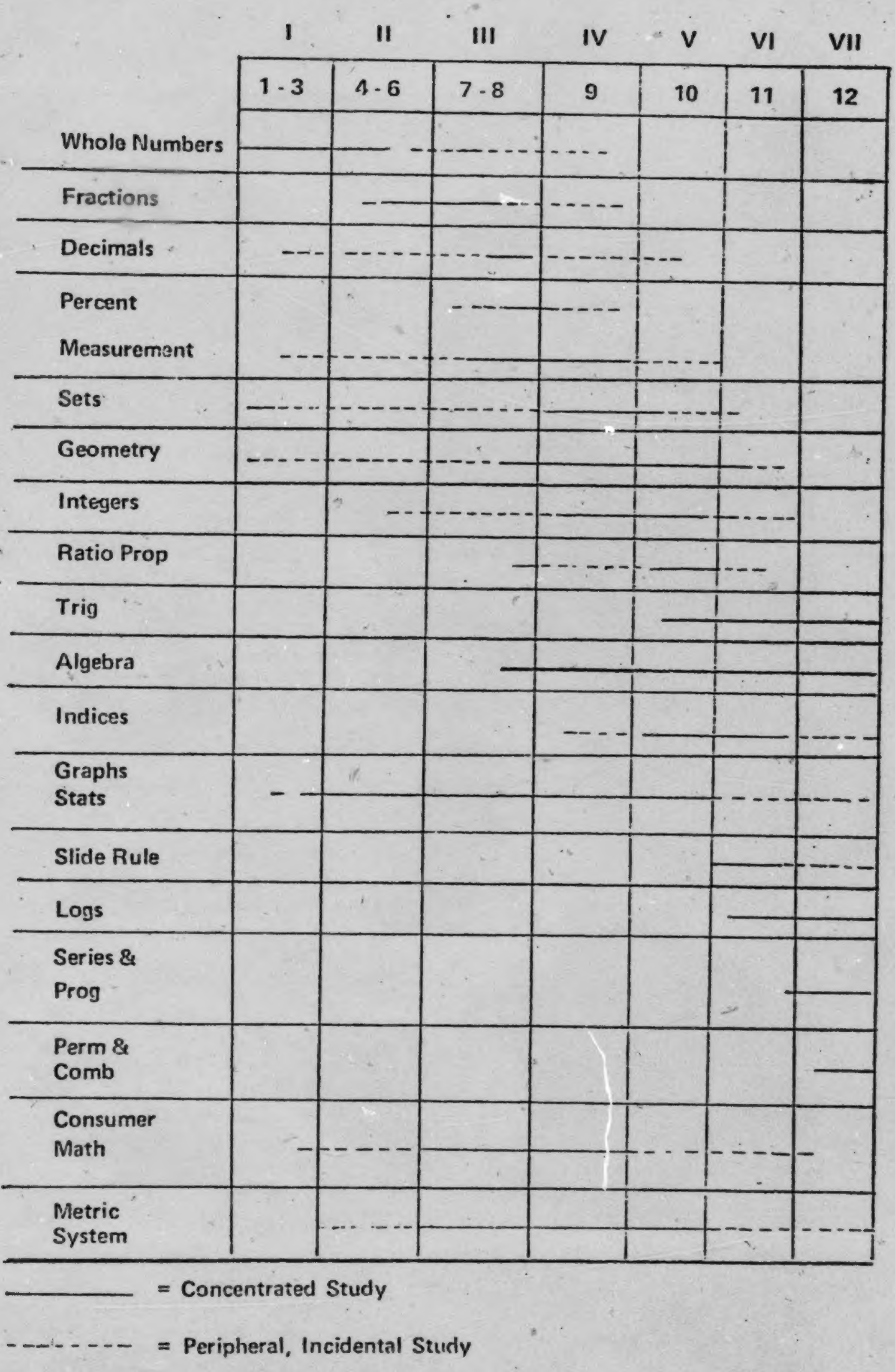
IMPLEMENTATION OF CANADORE CAM: MATH BLOCK MASTERY SYSTEM

In the near future, the Canadore CAM: Math Block Mastery System will be initiated. At that time, students will cease studying under the old "LINC" System and be engaged in the new Canadore System. The changeover will be a gradual one. Students will be given a thorough initiation into the nuts and bolts of the Canadore Math. As many questions as possible will be answered before the student commences the course.

The initiation will commence with level 2 and expand upward as the situation suggests. Level 1 will be introduced at the discretion of the instructor. All levels ought to be operational within six weeks of the initiation of the Block Mastery System.

APPENDIX "D-1"

CONTENT TOPICS BY CURRICULUM LEVELS MATRIX


I
II
III
IV
V
VI
VII
1 - 3
4 - 6
7 - 8
9
10
11
12
Whole Numbers
Fractions
Decimals
Percent
Measurement
Sets
Geometry
Integers
Ratio Prop
Trig
Algebra
Indices
Graphs
Stats
Slide Rule
Logs
Series &
Prog
Perm &
Comb
Consumer
Math
Metric
System
——— = Concentrated Study
- - - - - - = Peripheral, Incidental Study

APPENDIX "D-2"

CONTENT OUTLINE OF CANADORE CAM: MATH

01 WHOLE NUMBERS

- 01 Counting
    - 01 number lines
    - 02 cardinal relationship
    - 03 counting by 2's, 3's, 7's, etc.
    - 04 ordering of numbers
    - 05 writing numbers
    - 06 rounding off
    - 07 place value
- 02 Even Numbers
    - 01 definition
    - 02 counting 2, 4, 6, etc.
- 03 Odd Numbers
    - 01 definition
    - 02 counting 1, 3, 5, etc.
- 04 Addition
    - 01 symbols
    - 02 use of number lines
    - 03 without carrying
    - 04 with carrying
    - 05 names of parts of addition question
    - 06 additive identity
    - 07 communitive property
    - 08 associative property
    - 09 distributive property
- 05 Subtraction
    - 01 symbols
    - 02 use of number lines
    - 03 without borrowing
    - 04 with borrowing
    - 05 check by addition
    - 06 names of parts
    - 07 written problems
- 06 Multiplication
    - 01 symbols
    - 02 as repeated addition
    - 03 multiplication tables
    - 04 horizontal multiplication
    - 05 multiplication using zero
    - 06 multiplicative identity
    - 07 communitative property
    - 08 associative property
    - 09 fill in blank (4 x __ = 20)
    - 10 names of parts of question

...2

01 WHOLE NUMBERS

- 06 Multiplication
  - 11 word problems
  - 12 highest common factor
  - 13 lowest common multiple
- 07 Division
  - 01 symbols
  - 02 subtractive method
  - 03 tradition method
  - 04 checking division
  - 05 division without remainders
  - 06 division with remainders
  - 07 word problems
- 08 Order of Operation
  - 01 rules
  - 02 application to problems

02 FRACTIONS

- 01 Introduction
  - 01 parts of a whole
  - 02 number line
  - 03 equivalent fractions
  - 04 lowest common denominator
  - 05 terminology
  - 06 ordering sets (sequencing)
  - 07 reducing
- 02 Addition
  - 01 like denominator
  - 02 one denominator common to other
  - 03 denominator prime to each other
  - 04 denominators containing common factors
  - 05 combinations - proper, improper, mixed numbers
  - 06 horizontal and vertical
  - 07 communitative property
  - 08 associative property
  - 09 problems (word)
- 03 Subtraction
  - 01 like denominator
  - 02 one denominator multiple of another
  - 03 denominator prime to each other
  - 04 denominator containing common factors

.../3

02 FRACTIONS

03 Subtraction

- 05 using combinations of proper, improper, mixed numbers
- 06 subtraction (horizontally, vertically)
- 07 without borrowing
- 08 with borrowing
- 09 word problems

04 Multiplication

- 01 symbols
- 02 use of word of
- 03 proper fraction by proper fraction
- 04 improper (mixed) by whole numbers
- 05 proper by improper (mixed)
- 06 improper (mixed) by improper (mixed)
- 07 multiplicative identity
- 08 communitative property
- 09 associative property
- 10 distributive property
- 11 word problems

05 Division

- 01 symbols
- 02 rule (reciprocal & inversion)
- 03 division of whole number by proper fraction
- 04 proper by proper fraction
- 05 proper by whole number
- 06 mixed by proper
- 07 mixed by whole number
- 08 mixed by mixed
- 09 word problems (1/4 of __ is 3)

06 Order of Operations

- 01 introduction to order of operations
- 02 complex fractions
- 03 problems

03 DECIMALS

01 Introduction

- 01 symbols
- 02 place value
- 03 number line order of decimals (comparing fractions)
- 04 reading decimals
- 05 writing decimals
- 06 changing to fractions
- 07 changing to decimals
- 08 rounding off

.../4

03 DECIMALS

- 01 Introduction
  - 09 repeating decimals
  - 10 number of decimal places
  - 11 significant digits
- 02 Addition
  - 01 symbols
  - 02 rule
  - 03 vertical addition
  - 04 horizontal
  - 05 without carrying
  - 06 with carrying
  - 07 word problems
  - 08 properties
- 03 Subtraction
  - 01 symbols
  - 02 rule
  - 03 names and parts
  - 04 vertical
  - 05 horizontal
  - 06 with borrowing
  - 07 without borrowing
  - 08 fractions and decimals
  - 09 word problems
- 04 Multiplication
  - 01 symbols
  - 02 rules
  - 03 multiplication by 10's & multiples of 10's
  - 04 decimal and fractions
  - 05 word problems
- 05 Division
  - 01 symbols
  - 02 rules (place holders)
  - 03 division by multiples of 10's
  - 04 termination of division
  - 05 division with decimals and fractions
  - 06 word problem

04 PERCENT

- 01 Reading, Writing and Equivalents
  - 01 symbols
  - 02 reading numbers in percent notation

.../5

- 04 PERCENT
  - 01 Reading, Writing and Equivalents
    - 03 identify as fraction with denominator of 100
    - 04 change percents to decimals
    - 05 change decimals to percent
    - 06 change percent to common fractions
    - 07 change common fraction to percent
    - 08 equivalents - percent, decimal, fractions
  - 02 Operations
    - 01 calculate % of numbers - type 1 - 0% of b = __
    - 02 word problems
    - 03 calculate percentage one number is to another - type 2 - a is __% of b
    - 04 word problems
    - 05 calculate number when percent of it is known - type 3 - 0% of __ = b
    - 06 word problems
- 05 RATIO AND PROPORTION
  - 01 Ratio
    - 01 define
    - 02 example
    - 03 symbols
    - 04 reduce to common fraction
    - 05 ratio to decimals
    - 06 word problems
  - 02 Proportion
    - 01 define
    - 02 example
    - 03 symbols
    - 04 direct proportion
    - 05 similar triangle
    - 06 inverse proportion
    - 07 pulleys
    - 08 gears
    - 09 word problem
- 06 CONSUMER MATHEMATICS
  - 01 Pay Calculation - Income
    - 01 per hour
    - 02 per day
    - 03 per week
    - 04 per month
    - 05 per annum

.../6

06 CONSUMER MATHEMATICS

- 01 Pay Calculation - Income
    - 06 piece work
    - 07 bonuses and tips
    - 08 commission
    - 09 fees
- 02 Taxes - Income
    - 01 income deducted
    - 02 U.I.C.
    - 03 Canada Pension
    - 04 income tax filing form
- 03 Budgets
    - 01 housing costs - buying
    - 02 housing costs - renting
    - 03 utilities
    - 04 groceries - per unit buying
    - 05 home insurance
    - 06 auto/transportation - insurance
    - 07 clothing
- 04 Banking
    - 01 loans, borrowing
    - 02 interest - simple, compound
    - 03 amortizing mortgages
    - 04 credit unions
    - 05 finance companies
    - 06 wills
    - 07 bankruptcy
    - 08 judgments

07 MEASUREMENT

- 01 Time
    - 01 definition and equivalencies
    - 02 symbols, abbreviations (second, minute, hour, day, month, year, centuries)
    - 03 convert 12 hour clock times to 24 hour clock times
    - 04 convert 24 hour clock times to 12 hour clock times, 12 hour clock times and 24 hour clock times - days
    - 05 add and subtract identical times and convert
    - 06 add different times and convert
    - 07 subtract different times and convert
    - 08 time zones
    - 09 word problems

.../7

07 MEASUREMENT

02 Distance

- 01 definitions as units
- 02 symbols, abbreviations (inches, feet, yards, miles)
- 03 conversion - feet to yards, etc.
- 04 add and subtract identical units of distance and convert
- 05 add different distances and convert
- 06 subtract different distances and convert
- 07 measure

03 Liquid

- 01 definitions
- 02 symbols and abbreviations (Imperial, Metric, U.S.)
- 03 conversions
- 04 add and subtract identical units
- 05 add different units
- 06 subtract different units
- 07 multiply different units
- 08 divide different units
- 09 word problems

04 Weights

- 01 definitions
- 02 symbols
- 03 conversions
- 04 add and subtract identical units
- 05 add different units
- 06 subtract different units
- 07 multiply different units
- 08 divide different units
- 09 word problems

05 Thermometers

- 01 definition
- 02 conversion
- 03 operations

06 Volume

- 01 formulas (cubes, squares, spheres, etc.)

08 SETS

- 0101 Symbols
- 0201 Operations using Sets
- 0301 Venn Diagrams
- 0401 Infinite and Finite
- 0501 Word Problems

.../8

09 GEOMETRY

0101 Terminology
0201 Symbols
0301 Shapes

04 Bi-section

- 01 lines
- 02 angles

05 Instruments

- 01 lines
- 02 angles

06 Construction

- 01 line
- 02 angles
- 03 figures
- 04 perpendiculars
- 05 parallel lines

07 Formulas

- 01 perimeter
- 02 area
- 03 circumference
- 04 volume

0801 Scale Drawing

09 Coordinate Geometry

- 01 four quadrants
- 02 graph with ordered pair
- 03 graph with a point
- 04 graphing equations with one unknown
- 05 graphing equations with two unknowns
- 06 graphs to solve simultaneous equations in two unknowns

10 INTEGERS

01 Introduction

- 01 definitions and symbols
- 02 number lines
- 03 ordering
- 04 inequalities
- 05 absolute value

02 Addition

- 01 horizontally and vertically

.../9

10 INTEGERS

- 03 Subtract
  - 01 horizontally and vertically
- 04 Multiplication
  - 01 horizontal and vertical
- 05 Division
  - 01 horizontal and vertical
- 0601 Order of Operations

11 ALGEBRA

- 01 Introduction
  - 01 terminology
  - 02 definition of terms
- 02 Operations
  - 01 addition using the number line
  - 02 horizontal and vertical addition using the laws of addition
  - 03 subtraction using the number line
  - 04 horizontal and vertical subtraction using the laws of subtraction
  - 05 horizontal and vertical multiplication of monomials, binonials and trinomials
  - 06 application of BODMAS rule in use of brackets
- 03 Laws
  - 01 commutative
  - 02 associative
  - 03 distributive
  - 04 multiplicative identity
  - 05 additive identity
- 04 Factoring
  - 01 simplifying products into factors
  - 02 formulas for factoring
- 05 Algebraic Fractions
  - 01 addition
  - 02 subtraction
  - 03 multiplication
  - 04 division
  - 05 solving equations in one unknown
  - 06 graphing algebraic equations in one unknown

.../10

11 ALGEBRA

- 05 Algebraic Fractions
    - 07 solving simultaneous equations in two unknowns
    - 08 graphing algebraic equations in two unknowns
- 06 Solution of Word Problems

12 INDICES

- 01 Introduction
    - 01 terminology (index, exponent, base coefficient)
    - 02 definition of X^m which equals $X \cdot X \cdot X \ldots$ for m factors
- 02 Laws of Indices
    - 01 law of multiplication $x^3.x^4 = x^7$
    - 02 law of division $\frac{x^{12}}{x^2} = x^{10}$
    - 03 law of powers $(x^3)^2 = x^6$
    - 04 power of a product $(x^2y)^3 = x^6y^3$
    - 05 power of a quotient $\left[\frac{x^3}{y^4}\right]^2 \quad \frac{x^6}{y^8}$
    - 06 meaning of a zero index
    - 07 meaning of a negative index
    - 08 meaning of a fractional index
    - 09 operations using indices
- 03 Standard Numbers (Scientific Notation)
    - 01 definition of standard or scientific notation
    - 02 changing large numbers to standard numbers
    - 03 changing standard numbers back to whole numbers
    - 04 changing small numbers to standard numbers
    - 05 changing small standard numbers back to (regular) whole numbers

13 GRAPHS & STATISTICS

- 01 Terminology
    - 01 mean (average)
    - 02 mode
    - 03 medium
- 02 Probabilities

.../11

13 GRAPHS & STATISTICS

03 Types of Graphs

- 01 line
- 02 bar
- 03 circle

14 METRIC SYSTEM

03 Liquid Measure

- 06 addition of unlike units
- 07 subtraction of like units
- 08 subtraction of unlike units
- 09 multiplication of like and unlike units
- 10 division of like and unlike units
- 11 problems involving liquid measure

APPENDIX "D-3"

EXPLANATION OF GENERIC OBJECTIVES

In any individualized program it is necessary for some sort of objectives to be written so that students can ascertain what is the immediate goal of their study. In the Canadore Comprehensive Achievement Monitoring - Mathematics (CAM-Math) System, we have decided to utilize a number of distinct but interrelated types of instructional objectives. Although, perhaps, initially more difficult to comprehend than the monotype approach, the eventual goal is to make the generation of the objectives a more understandable procedure.

The first type of objective that an instructor would write is called a generic objective, sometimes abbreviated as GO. This objective is a general one and is written in a standard format. The following is a possible GO:

Given a ① whole and decimal number ② orally,
Input String

the student ③ writes the ⑤ whole ④ number.
Output String

This GO is expressed in the standard or common format. The input string always commences with "Given" and the output string always begins with "the student". In addition to the specific words common to all objectives, a particular GO can consist of between 3 and 5 elements (the numbers refer to the above example):

.../2

(1) Indicates the particular stimulus required; it consists of what information the student needs in order to do the task.

(2) Indicates mode of input or how this information is received by the student (e.g. orally, visually, from memory). In CAM-Math it is assumed that the mode is written and this element is given only if the mode is other than visual.

(3) Indicates the behavioral indicator or general operation. It is an action verb that tells what activity the student will perform - (e.g. calculate, designate, write).

(4) Indicates the thing operated on or the component. It is what the student will calculate, designate, write and so on.

(5) Indicates any modifier that may be necessary to further describe the output expected.

A Generic Objective does not contain any specific content but indicates a class of objectives all having identical procedures but differing in specifics. Another example of a generic objective would be:

> Given two or more whole numbers to add, not requiring carrying, the student calculates the sum.

.../3

This is generic because it contains no specific content, the addends could be any number (two is the logical minimum) and each would consist of any number of digits.

This GO is placed at the lowest instructional (grade or difficulty) level appropriate and could appear in any number of succeeding levels as indicated by the specific content.

A specific Content Objective (CONOB) for a low level could map the numbers 6 and 3 to the preceeding GO to form the following content objective:

> Given the numbers 6 and 3 to add,
> the student calculates the sum as 9.

At a somewhat higher difficulty (grade or level) the numbers 1,463,132 and 8,325,827 could be mapped into the original GO to form a more difficult CONOB.

A Generic Objective mapped across all or several levels of difficulty or a set of interrelated generic objectives at a particular level of difficulty can be subsumed into a criterion objective (CO). A possible CO at a specific level might be:

> Given 10 addition problems of whole numbers (not requiring carrying) with up to 8 addends and 6 digits, the student calculates the sum for 9 out of 10 problems.

.../4

At this stage enters the idea of achievement for a random sample of similar problems with an appropriate mastery standard. It is for the purpose of reaching this criterion with these particular problems that the generic objectives and the content that was mapped onto them were developed. It is these CO's that form the bases for grouping instruction into administrative divisions (e.g. Blocks, Units and Instructional Modules).

The Criterion Objective that includes all appropriate content difficulties (across levels) for a set of generic objectives can also be termed a Terminal Objective (TO). It is this terminal behaviour (among others) that is expected from an individual who aspires to a particular stated goal. These TO's could vary if the goal is entry to a skilled trade or alternatively, to a university.

CONCLUSION

This paper has attempted to introduce some of the various types of instructional objectives designed into the CAM-Math System. However, it is important to remember that this is merely an overview and does not represent an attempt to be an instruction manual for designing these objectives within a CAM System.

GENERIC OBJECTIVE

The "generic objective" (GO) is a standardized format for a behaviourally-oriented objective that is both specific and general. It is specific in that it describes the type of stimulus to be given, states how it will be presented and limits the student response to a particular behaviour. It is general in that it does not cite the specific stimulus material or content to be used.

For any objective in any course (including skill) if the objective can be expressed behaviourally, then it can be formulated as a generic objective.

EXHIBITS

Adequately expressed GO:

> Given a whole number orally, the student writes it in numeral form.

Too Specific for a GO:

> Given the number 113 orally, the student writes it in numeral form.

Too General for a GO:

> Given a number orally, the student writes it in numeral form.

> Given a whole number, the student writes it in numeral form.

> Given a whole number orally, the student writes it.

GENERIC OBJECTIVE FORMAT

1. - particular stimulus required
2. - mode of input

Input String

GIVEN A WHOLE AND $\underset{1}{\text{DECIMAL}}$ NUMBER $\underset{2}{\text{ORALLY,}}$

THE STUDENT $\overset{3}{\text{WRITES}}$ THE $\overset{5}{\text{WHOLE}}$ $\overset{4}{\text{NUMBER}}$

Output String

3. - behavioural indicator; action verb
4. - indicates the thing operated upon; the activity performed
5. - modifier to further describe output expected

APPENDIX "D-4"

GENERIC OBJECTIVE CARD

GENERIC OBJECTIVE CARD

GENERIC OBJECTIVE

assification:

Levelling Phase:

Introduce ☐
Recycle ☐
Review ☐

Approval:

Initiator ☐
Instructor ☐
Evaluator ☐

The following is a diagramatic explanation of the elements of this card.

1	2	3	4

1 - Topic

2 - Sub Topic

3 - Sub Topic

4 - Objective Number

1	2	3	4

1 - Curriculum Level (Grade)

2 - Block (19 Max.)

3 - Unit Sequence in Block (Max. 9 Units)

4 - Instructional Module - Criterion Objective within Unit (Max. 9 Modules)

The bottom of the card can be interpreted thusly:

(1) Classification	(2) Levelling Phase	(6) Approval
	(3) Introduce	(7) Initiator
	(4) Recycle	(8) Instructor
	(5) Review	(9) Evaluator

(1) Classification Cell - two descriptors including topic and subtopic names.

(2) Levelling Phase indicates in what sequence the objective occurs for an individual learner.

(3) Introduce - this is the first time that a learner encounters this objective.

(4) Recycle - this is an objective that is being taught again but at a higher level than before.

(5) Review - this is an identical objective that a student learned before but which he is required to relearn.

(6) Approval format:

- can be used either before and/or after typing.
- people approving indicated as:
  - (7) person who originally writes objective
  - (8) person checks content
  - (9) CAM Evaluator who gives final check on entire objective.

The numbers (1-7) listed vertically on the left side of the card indicate the Curriculum Level(s) in which this objective appears. This could be only one level or could be as many as 3 or 4 levels if this is the desired frequency.

APPENDIX "D-5"

SELECTED SAMPLES OF GENERIC OBJECTIVES

03	05	06	00	GENERIC OBJECTIVE	2	28	4	6

Given a word problem involving the division of decimal numbers, the student solve the problem.

The decimal numbers have no less than 2 digits to the right of the decimal point.

	*
	*

lassification:

Decimals - Division

Levelling Phase:

Introduce ☒
Recycle ☐
Review ☐

Approval:

Initiator ☑
Instructor ☑
Evaluator ☐

07 | 01 | 07 | 01 GENERIC OBJECTIVE 2. | 31 | .2 | 6

Given two or more different units of time, the student converts them to identical units, calculates the difference and selects its other appropriate unit or units of time.

There are two different units of time employed.

	*
	*

Classification:

Measurement - Time

Levelling Phase:

Introduce ☑
Recycle ☐
Review ☐

Approval:

Initiator ☑
Instructor ☒
Evaluator ☑

03 | 05 | 06 | 03 GENERIC OBJECTIVE 2 | 28 | 3 | 2

Given a word problem involving the division of decimal numbers, the student identifies that the operation of division is necessary for its solution.

The decimal numbers have no more than 2 digits to the right of the decimal point.

	*
	*

lassification:

Decimals - Division

Levelling Phase:

Introduce ☒
Recycle ☐
Review ☐

Approval:

Initiator ☐
Instructor ☐
Evaluator ☐

APPENDIX "D-6"

NUMBER OF GENERIC OBJECTIVES IN CONTENT TOPICS BY CURRICULUM LEVELS MATRIX

NUMBER OF GO'S IN TOPIC BY LEVEL MATRIX

TOPIC						TOPIC NO.
METRIC SYSTEM	0	2	44	0	0	19
GRAPHS & STATS	0	0	34	16	0	14
INDICES	0	0	0	5	8	13
ALGEBRA	0	0	0	25	41	12
INTEGERS	0	0	0	32	27	10
GEOMETRY	1	1	5	39	20	9
SETS	0	0	0	21	1	8
MEAS.	0	58	49	7	2	7
CONSUMER MATH	8	20	42	19	20	6
RATIO & PROP.	0	5	8	8	28	5
PERCENT	0	8	21	12	0	4
DECIMALS	0	62	39	0	0	3
FRACTIONS	1	78	34	0	0	2
WHOLE NUMBERS	61	67	24	1	0	1
TOTALS	71	301	300	185	147	1004
	1	2	3	4	5	

LEVELS

APPENDIX "D-7"

ABBREVIATES ADMINISTRATIVE OUTLINE
OF GENERIC OBJECTIVES

LEVEL I OUTLINE

01 . WHOLE NUMBERS: INTRO.:

1 (5) cardinal; numerals; ordering; numberline; counting.

2 (1) place value

3 (4) even; counting (even nos.); odd; counting (odd nos.).

02 WHOLE NUMBERS: ADD:

1 (5) sum-no. line; symbol-add; symbol equals; no. equals total; use of + and equals.

2 (5) nos. equals "addends"; definition addend; sum; sum vs "total"; nos. sentence symbol equals.

3 (5) add-no carrying; add-carrying; adding from w. problems; w. problem-adding

03 WHOLE NUMBERS : SUBTRACT:

1 (2) sub.- no. line; sym.-sub.

2 (3) sub.-no borrowing; sub.-borrowing; check sub. by add.

3 (3) part-minuend; part-subtrahend; part-difference

04 WHOLE NUMBERS: MULTIPLY:

1 (3) sym.-mult.-arith. exp.; add. prob. as mult.; mult. as add.

2 (4) three two's are; num. x 1; num. x 0; product from mem.

3 (5) multiplier in exp.; x x y is __; prod. of x and y is __; 3 x ? = 18; factor of terms

4 (3) exp.-mult. whole nos.; w. prob.-mult. whole nos.-exp. and solves.

05 WHOLE NUMBERS: DIVIDE:

1 (3) sym.-"divide"-exp.; x into y goes ? times; x divided by y is;

2 (7) div.-repeated subt.; div.-trad. method; check division; div.-evenly; select terms-div.; 0 divide a;

3 (5) w. prob.-div.-exp.-obtain exp.-solves

06 FRACTIONS:

1 (1) name of geom. figure

2 (7) 4 of 7 parts; fractions-no. line; part-numerator; part-denominator; select proper frac.; select improper fractions; select mixed nos.

06

3 (5) fractions: sum-no. line; sum-proper-common denominator; common denom.; LCD; one function of other denominator.

4 (3) fractions-dif.-common denom.; dif.-factor of denom.; borrowing not necessary.

07 CONSUMER MATH.:

1 (2) change-from bill; from fees to bill.

2 (6) hourly rate-wage; daily rate-pay; weekly rate-pay; monthly rate-pay; yearly rate-pay; piece work rate-pay.

LEVEL 2 OUTLINE

20 Whole Numbers
  1 (4) numerals; place value; ordering nos.; round nos.
  2 (4) associative prop. of add.; commutative prop. of add; additive identity; sum-carrying
  3 (3) w. prob.; adding-expression-solve
  4 (4) subt.-no. line; subt.-no. borrowing; subt.-borrowing; check subt.
  5 (3) exp.-"minuend"; exp.-"subtrahend"; exp.-"difference"
  6 (3) w. prob: subt.-expression-solve

21 Whole Numbers
  1 (6) add. as mult. prob.; mult. as add prob.; three two's are?; prod. from mem.; "multiplier in exp." factor exp.
  2 (5) exp. mult. by ten; product-horizontal; x times y is ? the prod. of x and y is ? 3 x ? = 18.
  3 (6) mult. by 1; mult. by 0; communitative prop.; associative; multiplicative identity; distributive.
  4 (3) w. prob.: mult.-exp.-solve
  5 (4) "prime no."; exp.-prime nos.; exp. HCF; exp.-LCM

22 Whole Numbers
  1 (6) symbol ÷ exp.; quant. of x div. by y is ? div. rep. subt; div.-trad.; terms in div.-eg. check div.
  2 (7) div. evenly; x into y goes ? times; x divided by Y is ? o divided by a is ? a divided by o is ? div.-remainder; check div.
  3 (3) w. prob.-div.-exp.-solve
  4 (5) step no. of oper.; order of oper.; w. prob. order of oper.-exp. -solve

23 Fractions
  1 (7) 4 of 7 parts; improper-mixed; mixed-improper; equivalent fractions; procedure-reduction; reduced frac. ordering
2 (7) common factors; prime common denom.; sum-horizontal;

sum-vertical; sum: prop. & improper; sum-prop. & mixed.
3 (3) sum-denom. prime; sum-common factors; sum-comb. of fractions.
4 (2) commutative; associative
5 (3) w.prob. add fractions - exp. - solve

24. FRACTIONS:
1 (4) subt-vertical; subt.-horizontal; subt-denom. prime; subt-common factors-denom.
2 (5) subt-prop. & mixes; subt-prop. & improper; subt-improper & mixes; subt-borrowing; subt-combinations.
3 subt-w.prob. - exp. - solve

25 Fractions
1 (4) symbol "x"-exp., symbol "of"-exp.; product-proper product - prop. & improper.
2 (5) product: improper; product: whole & improper, product: whole & mixed; product: prop. & mixed. product: mixed.
3 (5) multiplication identify; commutative; associative, distributive - add; distributive - subtraction.
4 (3) w.prob. mult. of fractions - exp. - solve

26 Fractions
1 (5) symbol "÷" exp.; procedure ÷ ; quot. - prop. & whole quot.- whole by proper; quot. - proper.
2 (4) quot. - improper by whole; quot.-improper by proper; quot.-improper; $\frac{1}{x}$ of ? = M
3 (3) w. prob.: div. of fractions - exp. - solve.
4 (4) order of ops., w. prob. - order of ops. - solve

27 Decimals
1 (8) def'n. - decimal fract.; def'n.-decimal pt.; decimal aloud; decimal writes; decimal nos.; decimal

in words; decimals on No. 1 re defn.-mixed decimal

2 (4) place value-dec.nos.digits; sig. digits, level of accuracy; place value - dec. fract.

3 (6) dec.-fract., mixed dec.-mixed no. mixed no.-dec., fract-dec.(accuracy) def'n. "repeating dec."; frac.-rep.dec.

4 (9) sym. "+" exp., decimal pts.-vertical, add-no. carrying; add-carrying sum-vertical; sum-horizontal; sum-whole & dec.; w.prob. - add dec. - exp.-solve.

5 (8) sym. "-"exp., names part-subt, subt.-no. borrowing; subt.-borrowing; subt.-horizontal, format; subt.-horizontal; w.prob.: subt. exp.-solve

28 Decimals

1 (8) sym. "x" exp.; mult. by 0; mult. by 10; decimal place; w.prob.-mult. of dec.-exp.-solve commutative; associative.

2 (8) sym. "÷ " exp.; div.-decimal pt.; no dec. pt.in divisor; div.-places moved; quot.-div. by 10; divide-decimal place; div.-no decimal;div.-remainder as decimal

3 (5) quot. - dec. & fract.; w. prob. - div. dec.; exp.-solve;
quot. at accuracy;

4 (8) w. prob. - add dec.; w. prob.-subt. dec.;subt.-frac. & dec.; w. prob.-mult.; mult.-frac. & dec.; w. prob.-div.dec.; ans.-no. of dec. places; format for add & subt.

29 Percent & Ratio

1 (5) sym. "%" exp.; % num'words; frac.-%; dec.-%; %-dec.

2 (3) frac.-dec.& %; dec.-% & frac.; % - dec. & frac.

3 (5) ratio - defn.; ratio of 2 nos.; ratio - eg.; ratio-reduced; ratio-equivalent

30 Consumer

1 (8) hourly rate-pay; daily rate-pay; weekly rate-pay;

monthly-rate pay; yearly rate-pay; fees - total charges; rate of commission-amt.; piece work rate-pay.

2 (6) change; cost: one item-many; total price-one item; better buy, w. prob.-cost of food same & diff.

3 (6) water meter; utility-costs; utility meter; w. prob.-procedure utility; - exp.- solve

31 Time Length Distance

1 (4) sym. - unit of time; time - relationships; 12 - 24 time; 24 - 12 time

2 (8) sum - id. time; subt. - id. time; sum-dif. time; sum-dif. units time subt.-dif. units of time - exp.-solve

3 (6) length: symbol, convert units; calibre of instruments; measure metric; metric units

4 (6) Distance: sum-identical; sum-different; subt.-dif. units-converted

5 (3) w. prob: meas. of distance- exp.-solve

32 Liquid Measure

1 (6) Liquid measure: symbol; convert units; sum-similar units; sum-convert,-sum-dif. units w & w/o conversion

2 (4) Liquid meas.: subt.-similar units w. & w/o conversion; subt.-dif. units - w & w/o conversion

3 (2) Liquid meas.: mult.; div.

4 (3) Liq. meas.: w. prob.-exp.solve

33 Weight Measures:

1 (5) weight - def'n.; symbol; convert units; - dif. units

2 (3) sum - identical units, w & w/o conversion;

3 (3) subt. - identical units w & w/o conversion

4 (2) mult.; div.

5 (3) w. prob. weights - exp. - solve

6 (2) geo. shape; volume of shape

LEVEL 3 OUTLINE

40. Whole Numbers:

1(5) round off, additive identity, associative, commutative, distributive.
2(2) mult-parts; factors
3(3) w. prob. - mult - exp. - solve
4(4) "prime no." defn., eg. of prime nos.HCF, LCM
5(3) quot. of x ÷ by y is ?, div. leaving remainder express remainder
6(3) w. prob.: div. - exp. - solve
7(4) order of ops.; w. prob. - order of ops. - exp. - solve

41. Fractions:

1(4) no. line; reduction; prime denom, lowest common denom.
2(7) sum - common factors; sum - denom. - prime associative; sum-combination w. prob. - add - exp. - solve
3(4) subt. - borrowing; w. prob. - subt. - exp. - solve

42. Fractions - Mult.:

1(5) multiplicative identity, commutative associative; distributive over add; distributive over subt.
2(3) w. prob. - mult. - exp. - solve
3(4) 1/4 of ? is 3; w. prob. - div. - exp. - solve
4(7) procedures - complex fract.; ans. - complex fract.; sequence of ops.; w. prob. - order of ops. - exp. - solve

43. Decimals:

1(8) reads no.; words represent; id. dec. no.; write decimal; on no. line place value; ordering; ans. - decimal places
2(8) equiv.; frac.→ dec.; dec.→ fract.; mixed dec.→mixed no.; repeating dec.→fraction seg. digits; level of accuracy
3(5) commutative; associative; w. prob. - add dec. - exp. - solve
4(3) align dec. points; w. prob. - subt. - exp. - solve

44. Decimals:

1(2) mult. by 10 - places moved & mult.
2(3) w. prob. - mult. - exp. - solve; mult. - frac. & dec.
3(6) no dec. in divisor; moving decimal places, div. by 10's; div. - level of accuracy; div. - dec. & fraction
4(4) w. prob. - div. - operation - exp. - solve

45. Fractions & Decimals:

1(4) Frac.→%; %→frac. denom. of 100; %→fraction; mixed no. %→frac.
2(2) dec.→%; %→dec.
3(3) frac.→% & dec.; dec.→% & frac.; %→dec. & frac.

46. Percents & Ratios:

1(2) Type I: x % of y = a: calc. & w. prob. - exp. - solve
2(4) Type II: x is a % of y: calc. & w. prob. - exp. - solve
3(4) Type III: x% of a = y: calc. & w. prob. - exp. - solve
4(6) def'n. - ratio; ratio - eg.; ratio from 2 nos. lowest terms;

ratio dec.; % ratio
5(2) equivalent ratio; ratio a/b to proportion

47. Consumer: Pay & Prices:

1(5) hourly rate - pay; daily rate - pay; weekly rate - pay; monthly rate pay ; yearly rate - pay
2(3) fees - total change; price work rate - pay; commission rate - amt. calc.
3(2) rental rate - year; % income for rent;
4(2) defn. - types of prices; sale price;
5(5) food - for 1; one to many items; better buy; w. prob. - cost of food - exp. - solve

48. Consumer: Car, Utilities & Finance:

1(3) m.p.g. - distance; av. speed, odometer
2(4) insurance terms; premium; car premium; better buy
3(7) gas meter; electricity meter; utility meter; costs of utility w. prob. - utility procedure - solve
4(6) "finance company" - term; "bank" vs. "fin. co."; "credit Union"; "int. & principal"; "demand loan"; "collateral loan"
5(5) interest; w. prob. - interest - loans

49. Time & Distance:

1(3) time zones; 12 24 hrs. time; 24 to 12 hrs. time;
2(3) sum - time; sum - time - convert;
3(3) difference - time - w. & w/o time
4(2) w. prob. - time - exp. - solve
5(2) calibre of instrument, measure
6(3) w. prob. - distance - exp. - solve

50. Liquids & Weights:

1(3) liq. meas.: sum of similar & dif. units
2(2) liq. meas.: diff. of similar & different units
3(2) liq. meas.: mult. & div.
4(3) liq. meas.: word prob. - solve - exp.
5(2) weights: convert
6(2) weights: sum & diff.
7(2) weights: mult. & div.
8(3) weights: w. prob. - solve - exp.

51. Thermometer & Geometry:

1(7) thermometer - defn. - points on scale; sym., sum of ident. & dif. units; diff. Of ident. & dif. units
2(5) thermometer: mult. & div.; w. prob. - solve - exp.
3(3) name of geom. shape; formula; perimeter
4(2) formula for area; compute area
5(3) volume: formula & compute

52. Graphs & Stats.:

1(3) defn. - mean; cal. mean;

2(7) pictogram; - select & procedures - constr.

reading - comparitive - question - interpretation
3(7) line graph: - select - procedures - const. - comparitive - value of pt. - interpretation
4(7) bar graph: select - procedures - const. - comparative - value of pt. - interpretation
5(7) write graph: select - procedures - const. - comparitive - value of pt. - interpretation
6(3) w. prob. - graph - solve - exp.

53. Metric - Length:

1(3) length: Brit. to metric; metric to Brit. metric to metric
2(4) length: sum & dif. of metric - similar & unlike
3(4) mult. & div. of sim. & dif. units
4(3) w.prob. - metric - solve - exp.

54. Metric - Weight:

1(4) units in metric; Brit. to metric, metric to Brit., conversion factor
2(4) sum & dif. of similar & different units
3(4) mult. & div. of similar & dif. units
4(3) w. prob. - metric wt. - solve - exp.

55. Metric - Liquid:

1(4) units of meas.; Brit. to metric, metric to Brit.; conversion factor
2(4) sum & dif. of similar & dif. units
3(4) mult. & div. of similar & dif. units
4(3) w. prob. - liquid meas. - metric - solve - exp.

LEVEL 4 OUTLINE

60. WHOLE NO.(1) & PERCENTS:

1(1) whole nos. - series of ops.
2(1) Type I - x% of y = a
3(3) w. prob. - Type I % solve - exp.
4(1) Type II x is a % of y
5(3) w. prob. - Type II - exp. - solve
6(1) Type III, x % of a = y
7(3) w. prob. - Type III - solve - exp.

61. RATIO & CONSUMERS:

1(8) Ratio: defn.; eg. forming; reduce; equivalent; to decimal; percent to ratio; ratio to proportion
2(5) Pay: hourly rate; eg. hourly, daily; weekly, monthly, yearly
3(3) fees to charges; piece work rate to pay; commission rate to total

62. CONSUMER & TEMPERATURE:

1(4) defn. - principal; costs of home; rent & buy; depreciation of car
2(6) simple & compound int.; defn. - will; defn. discount loan w. prob. - loans - exp. - solve
3(2) convert: temp. scale
4(3) w. prob. - temp. - exp. - solve

63. SETS:

1(8) select sets; satisfy limits; define limits, $\{\}$; $\in$; $\supset$; ; $\subset$; $\cap$;
2(6) limits - identical sets; equivalent set; finite set; infinite set; null set; subset
3(5) $A \cup B$; $A \cup B$; Venn diag. union-Venn; Venn-disjoint
4(2) w. prob. sets - set notation - solve

64. GEOMETRY:

1(3) name of figure; as a figure; as a form
2(3) name of instrument; defn. of terms; defn. of symbols
3(2) congruent triangles; similar triangles
4(3) construct line & procedure & instruments
5(3) construct angle & proced. & instruments
6(3) figure - construct - procedures - instruments
7(3) parallel line - construct - procedures - instruments
8(4) bisect line - procedure - bisect angle - procedure
9(6) perpendicular pt. on and off line: instruments; procedure; construct

65. GEOMETRY:

1(4) perimeter: formula & compute circumference: formula & compute
2(4) area: formula & compute; volume: formula & compute
3(3) w. prob.: geometry - procedure - solve

66. INTEGERS:

1(3) pos. or neg., in words; in symbols
2(4) no. line; opposite; absolute value; order
3(2) inequality - operation: calc. & missing element

67. INTEGERS:

1(4) sign of sum; sum; sum - vertically; sum - horizontally
2(3) w. prob. - adding integers - exp. - solve
3(3) sign of diff.; diff - vertically; diff. - horizontally
4(3) w. prob. - subt. of integers - exp. - solve

68. INTEGERS:

1(3) mult. - sign: opposite & liked sign; horizontal mult.
2(3) w. prob. - mult. of Integers - exp. - solve
3(3) w. prob. - div. of integers - exp. - solve
4(3) rules of ops.; simplified expression remove parentheses

69. ALGEBRA:

1(4) symbols: constants & variables, algebraic exp.; defn. - formula; binominals
2(3) numeral coefficent; equivalent exp., into word exp.
3(4) sum: vertical & horizontal; dif. vertical & horizontal
4(1) calc. of one variable

70. ALGEBRA & INDICES:

1(2) product: nominal - horizontal & vertical
2(2) product: binominal - vertical & horizontal
3(3) pt. on no. line; sum on no. line; dif. on no. line
4(2) w. prob. - one unknown - exp. - solve
5(3) w. prob. - alg. expression - exp. - solve
6(5) indices: base; index equiv. as mult., equiv. as index mult. - identical base

71. GRAPHS & STATS.:

1(4) mode: defn.; calc. whole & decimal nos.; 2 modes
2(5) median: defn.; calc. nos. occurring & not; event total of nos.
3(2) range: whole & decimals
4(5) defn. probability; calc. ratio outcome certain; no. possibility of outcome; odds

LEVEL 5 OUTLINE

80. RATIO & PROPORTION:

1(4) ratio: defn.; symbols, a:b to a/b
2(4) ratio - eg. forming; reduced; equivalent
3(2) as decimal; % to ratio
4(3) w. prob. ratio - exp. - solve
5(4) proportion: defn.; eg. symbols
6(5) direct prop.; inverse prop.; similar triangles
7(4) pulleys - formula; calc.
8(3) w. prob. - proportion - exp. - solve

81. CONSUMER MATH. & SETS(1):

1(4) Fed. Tax: heading; Income, Net Income, Personal Exemption
2(4) CPP, UIC
3(5) Taxable Income; amt. of tax dec., total tax due; total owing
4(4) defn. & eg. judgement; bankruptcy, amortizing mortgage: w. prob.
5(3) total interest; prin. & int.; w. prob. - interest
6(1) w. prob. - sets

82. GEOMETRY:

1(2) scale drawing - proced. & construct
2(2) pythagoreanth: proced. & compute
3(2) perimeter: formula & calc.
4(2) area - formula & calc.
5(4) volume: formula & calc.

83. GEOMETRY:

1(2) 4 quadrants;
2(4) ordered pair or graph; location line on graph - 1 unknown & 2 unknowns
3(2) graph: 2 simultaneous eqns.
4(3) w. prob.: geom. sol. - exp. - solve

84. INTEGERS:

1(4) absolute value; order; inequality & operate
2(3) sum: integers; horizontal & vertical
3(3) w. prob. - adding integers - exp. - solve
4(2) diff. - horizon. & vert.
5(3) w. prob. - subt. integers - exp. - solve

85. INTEGERS & ALGEBRA:

1(3) Integers mult. - sign - horizontal
2(3) w. prob. - mult. of Integers - exp. - solve
3(3) w. prob. - div. of integers - exp. - solve
4(3) rules: order of ops.; remove paren.;
5(2) Algebra: symbol formula; inequalities
6(3) equiv. expression; mult. inverse
7(3) commutative law; associative distributive

86. ALGEBRA:

1(3) LCD: algebra fractions
2(2) sum of alg. exp.
3(2) dif. of alg. exp.
4(3) prod. of alg. exp. - quot. of alg. exp.
5(2) value - variable(one) - value - 2 variables
6(2) graph line - 1 variable - graph line - 2 variables

87. ALGEBRA:

1(2) simplify exp.(mult.)
rule: common factors
2(1) factoring perfect sq.
3(3) factoring dif. of sq.: rule & calc.
4(2) factor incomplete sq. - rule
5(2) factor trinomial: rule & eg.
6(3) common factoring: rule & eg.

88. ALGEBRA & INDICE:

1(2) Algebra: prod. trinomials & horizontal
2(5) w. prob. - 2 unknowns - solve - exp. - seq. of steps - w. prob. alg. exp. - exp. - solve
3(4) Indices - base; exponent as mult. prob.; as index
4(4) mult. 2 index nos.: procedures & calc. - div. 2 index nos.: procedures & calc.

APPENDIX "D-8"

TEST ITEM CARD

ANS	UNIT	LESSON	OBJECT.	OBJECTIVE/ITEM	MI	SUPPLEM.

APPENDIX "D-9"

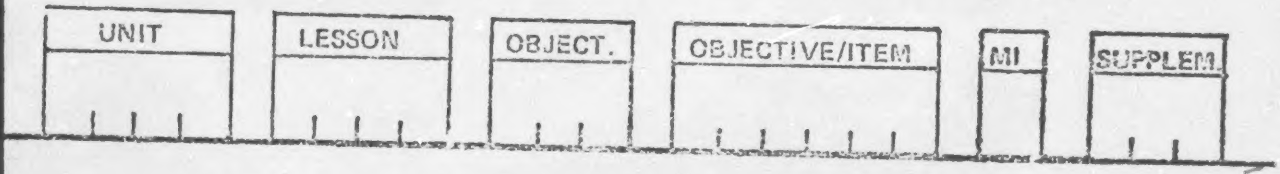
SPACING GUIDE

FOR TYPING ITEMS ON CARDS

_____ 38 44 The sum of 4 and 3 is

47 1) 58 2) 69 3) 80 4) 91 5)

1 1/2 SPACE
3 SPACES IF FRACTIONS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_____ The sum of 2 and 4 is

1) 2) 3) 4) 5) not given

5 OR LESS

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1) 3)
2) 4)
5)

6 - 16

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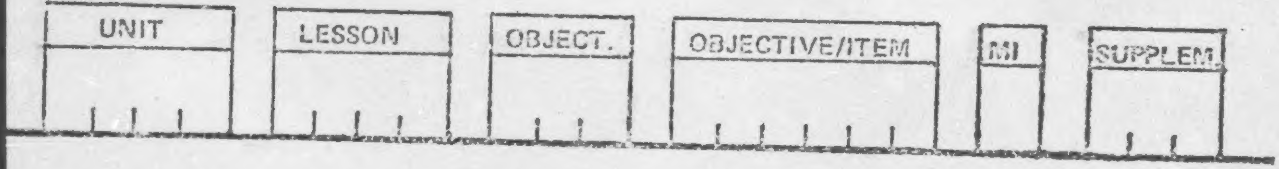
1)
2)
3)
4)
5)

17 OR OVER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MI
SUPPLEM.

APPENDIX "D-10"

SELECTED SAMPLES OF TEST ITEMS

____ Lawn chairs were on sale. Five chairs were $43.52, but the Smith family needed only one chair. How much would it cost them?

1) $8.70
2) $4.38
3) $7.60
4) $8.73
5) Not given

ANS	UNIT	LESSON	OBJECT.	OBJECTIVE/ITEM	MI	SUPPLEM.
1				2 28 4 6 0 1		
✓						

______ The difference in time between 3 weeks and 18 days is:

1) 72 hours
2) 36 hours
3) 42 hours
4) 144 hours
5) not given

ANS	UNIT	LESSON	OBJECT.	OBJECTIVE/ITEM	MI	SUPPLEM.
1				2 31 2 6 0 1		

_____ If you paid the cleaner $9.53 for 4 pairs of pants. What operation would you perform to discover the cost of cleaning for 1 pair of pants?

1) Divide $9.53 by 4
2) Divide 4 by $9.53
3) Subtract 4 from $9.53
4) Multiply $9.53 x 4
5) Not given

ANS	UNIT	LESSON	OBJECT.	OBJECTIVE/ITEM	MI	SUPPLEM.
1				2 28 3 2 0 1		

✓

______ If Dave paid $5.95 for gas per week and his car runs on 89¢ per mile. How many miles can he drive per week? Identify the operation necessary here.

1) Subtract 89¢ from $5.95
2) Divide $5.95 by 89¢
3) Divide 89¢ by $5.95
4) Multiply $5.95 x 89¢
5) Not given

ANS	UNIT	LESSON	OBJECT.	OBJECTIVE/ITEM	MI	SUPPLEM.
2				2 28 13 12 10 12		

V

_____ Tony bought new lawn equipment. Total cost was $101.22. If he bought ten items, what operation would you use to determine how much he spent on each item?

1) Multiply $101.22 by 10
2) 10 should be divided by $101.22
3) $101.22 should by divided by 10
4) Subtract 10 from $101.22
5) Not given

ANS	UNIT	LESSON	OBJECT.	OBJECTIVE/ITEM	MI	SUPPLEM.
3				2 28 3 2 0 3		

✓

_____ Farmer Jones sold 595 eggs at market for $33.55. How much is one egg worth to the farmer. What operation would you use to solve this problem?

1) Divide 595 by $33.55
2) Multiply 595 by $33.55
3) Subtract 595 from $33.55
4) Divide $33.55 by 595
5) Not given

ANS	UNIT	LESSON	OBJECT.	OBJECTIVE/ITEM	MI	SUPPLEM.
4				2 28 3 2 0 4		

✓

______ Mr. Ames drinks 12.2 bottles of whiskey per month. If his total bill per month is $131.58, what operation would give us the cost of 1 bottle?

1) Divide 12.2 by $131.58
2) Subtract $131.58 from 12.2
3) Add $131.58 + 12.2
4) Multiply $131.58 x 12.2
5) None of these

ANS	UNIT	LESSON	OBJECT.	OBJECTIVE/ITEM	MI	SUPPLEM.
5				2 28 3 , 2 0 5		

✓

APPENDIX "D-11"

SAMPLE CANADORE CAM REPORTS

```
 **********      **********    *          *     ********** 
************   ************   **        **   ************
**             **        **   ***      ***             **
**             **        **   ****    ****             **
**             **        **   ** **  ** **             **
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**             **        **   **        **             **
************   **        **   **        **   ************
 **********    **        **   **        **    ********** 

CAM3                      15/03/74 17:47:38 CAM3                       15/0
CAM3                      15/03/74 17:47:38 CAM3                       15/0
CAM3                      15/03/74 17:47:38 CAM3                       15/0
CAM3                      15/03/74 17:47:38 CAM3                       15/0
```

```
      COMPREHENSIVE ACHIEVEMENT MONITORING - GROUP SUMMARY REPORT  31718
  CANADORE MATH MONITORING  1-3                                          031
         STUDENT GROUP     0    ALL STUDENTS

                                                     TEST ADMINISTRATION
 CGN   CONTENT GROUP                   1    2    3    4    5    6    7    8
-----------------------------------------------------------------------------

       NUMBER OF STUDENTS             49   59

   1   BLOCK 01              AVG      20   41
                             NUM      10   12

   2   BLOCK 02              AVG      85   85
                             NUM      14   20

   3   BLOCK 03              AVG      60   75
                             NUM      10   12

   4   BLOCK 04              AVG      50   58
                             NUM      10   12

   5   BLOCK 05              AVG      56   68
                             NUM      16   16

   6   BLOCK 06              AVG      23   38
                             NUM      30   36

   7   BLOCK 07              AVG      50   66
                             NUM      10   12

  20   BLOCK 20              AVG      65   44
                             NUM      55   68

  21   BLOCK 21              AVG      46   51
                             NUM      60   62

  22   BLOCK 22              AVG      60   63
                             NUM      46   52

  23   BLOCK 23              AVG      61   41
                             NUM      55   68

  24   BLOCK 24              AVG      43   11
                             NUM      23   26

  25   BLOCK 25              AVG      45   38
                             NUM      37   36

  26   BLOCK 26              AVG      37   28
                             NUM      32   42

  27   BLOCK 27              AVG      63   59
                             NUM      46   52

  28   BLOCK 28              AVG      39   42
                             NUM      69   78
```

```
     COMPREHENSIVE ACHIEVEMENT MONITORING - GROUP SUMMARY REPORT  31719
  CANADORE MATH MONITORING  1-3                                        0315
         STUDENT GROUP     0    ALL STUDENTS

                                                    TEST ADMINISTRATION
CGN    CONTENT GROUP                1    2    3    4    5    6    7    8    9
-------------------------------------------------------------------------------

 29   BLOCK 29           AVG       41   42
                         NUM       46   52

 30   BLOCK 30           AVG       28   34
                         NUM       46   52

 31   BLOCK 31           AVG       35   41
                         NUM       37   36

 32   BLOCK 32           AVG       26   23
                         NUM       23   26

 33   BLOCK 33           AVG       44   18
                         NUM        9   16

 40   BLOCK 40           AVG       40   55
                         NUM       22   36

 41   BLOCK 41           AVG       50   74
                         NUM       26   27

 42   BLOCK 42           AVG       15   21
                         NUM       38   57

 43   BLOCK 43           AVG       34   45
                         NUM       38   57

 44   BLOCK 44           AVG       26   25
                         NUM       26   27

 45   BLOCK 45           AVG       46   51
                         NUM       26   27

 46   BLOCK 46           AVG       34   41
                         NUM       64   34

 47   BLOCK 47           AVG       22   38
                         NUM       22   36

 48   BLOCK 48           AVG       12   23
                         NUM       16   21

 49   BLOCK 49           AVG       18   23
                         NUM       16   21

 50   BLOCK 50           AVG       37   23
                         NUM       16   21

 51   BLOCK 51           AVG       40   33
                         NUM       22   36
```

```
      COMPREHENSIVE ACHIEVEMENT MONITORING - GROUP SUMMARY REPORT  31718
 CANADORE MATH MONITORING  1-3                                      031
          STUDENT GROUP     0     ALL STUDENTS

                                                 TEST ADMINISTRATION
  CGN   CONTENT GROUP               1    2    3    4    5    6    7    8

   52  BLOCK 52             AVG    19   29
                            NUM    42   48

   53  BLOCK 53             AVG    31   28
                            NUM    16   21

   54  BLOCK 54             AVG    12   19
                            NUM    16   21

   55  BLOCK 55             AVG    18   19
                            NUM    16   21

 7181  LEVEL 1 OBJ.         AVG    46   59
                            NUM   100  120

 7182  LEVEL 2 OBJ.         AVG    47   42
                            NUM   584  666

 7183  LEVEL 3 OBJ.         AVG    27   36
                            NUM   422  561

  113  OBJECTIVE  113       AVG     0   25
                            NUM     4    8

  121  OBJECTIVE  121       AVG    33   75
                            NUM     6    4

  231  OBJECTIVE  231       AVG    83  100
                            NUM     6    4

  232  OBJECTIVE  232       AVG    75   75
                            NUM     4    8

  235  OBJECTIVE  235       AVG   100   87
                            NUM     4    8

  321  OBJECTIVE  321       AVG    50  100
                            NUM     6    4

  322  OBJECTIVE  322       AVG    75   62
                            NUM     4    8

  434  OBJECTIVE  434       AVG    33   50
                            NUM     6    4

  443  OBJECTIVE  443       AVG    75   62
                            NUM     4    8

  522  OBJECTIVE  522       AVG    33   75
                            NUM     6    4
          COMPREHENSIVE ACHIEVEMENT MONITORING - FORM ANALYSIS REPORT
       CANADORE MATH MONITORING  1-3
                                                                 31718

 FORM 921     16 STUDENTS RESPONDED TO THE FORM DURING TEST ADMINISTRA
     QUESTION                               AVG                       RESPONSES(%)
      NUMBER     OBJECTIVE    ANSWER       SCORE        NR      1      2      3      4
        1          2721         3           50           0     25     25     50      0
        2          2314         5           25           6      0     37     25      6
        3          2923         1           18           6     18      6     31      0
        4          2063         4           18           0      0      0      6     18
        5          2831         1           12          25     12      6      6      0
        6          2525         5           37          12      6     37      0      6
        7          2153         2           56           6      0     56     12     12
        8          2842         3           87           0      0      6     87      0
        9          2013         3           25           0      6     25     25     12
       10          3024         5           50           0     12     31      6      0
       11          2242         2           75           6      0     75     12      0
       12          3212         3           18           6      0     18     18     12
       13          2353         2           62          12      0     62     18      0
       14          2644         5           56          12     18      6      0      6
       15          2615         4            0           6     12     12     18      0
       16          3352         2           18          25      0     18     25      6
       17          2754         3           43          12      6      0     43      6
       18          2921         1           43          25     43      6     18      0
       19          2024         3           81           6      0      0     81      6
       20          2345         5           37          18     18      6     18      0
       21          3128         4           75           0     12      0      6     75
       22          2221         1           50          12     50      6      6      6
       23          3016         4           43           6      0     18      0     43
       24          2424         3           18          12     43      6     18      0
       25          2136         1           12           6     12      6      0     37
       26          2332         2           12          25      0     12     18      0

              FORM 921:  TOTAL PERCENTAGE CORRECT =  39
 LANDRY YVON                    730090   SECTN  1    CORBETT M               031574
                                                         31713
       TEST ADM  2 -  3/12/74
 FRACTION CORRECT ON ALL ITEMS IS 14/25            FORM 931
 FRACTION CORRECT ON YES ITEMS IS 11/21

                                           TEST           FRN COR  FRN COR
CN  OBJ RP INS    CN  OBJ RP INS     ADM FORM     ALL       YES

 6 2014 5- YES   23 2723  + YES       1   921    15/26      0/ 0

18 2043  + YES    7 2744  + YES       2   931    14/25     11/21

10 2122  + YES   11 2835  + YES

 2 2143  + YES    3 2843 5- YES

14 2154  +        1 2846 5- YES

22 2226 4- YES   25 2922 1- YES

 4 2245  +        9 2935 5- YES

12 2317  + YES   17 3017 1- YES

20 2333  + YES   13 3035 5-

 8 2414 5- YES   24 3135  + YES

16 2513 3- YES   21 3153 5- YES

19 2535  +       15 3223  + YES

 5 2633  + YES   26    0


                                    CUM TOTAL  29/ 51  11/ 21
 HAZZARD RANDY                  730290   SECTN  1    MINOGUE N                0315
                                                        31718
       TEST ADM  2 -  3/12/74
 FRACTION CORRECT ON ALL ITEMS IS 12/26             FORM 921
 FRACTION CORRECT ON YES ITEMS IS  9/20

                                          TEST          FRN COR   FRN COR
CN  OBJ RP INS    QN  OBJ RP INS           ADM FORM       ALL        YES

 9 2013 2- YES   14 2644  + YES           1    931     14/25       0/ 0

19 2024    YES    1 2721 2- YES           2    921     12/26       9/20

 4 2063 5- YES   17 2754  + YES

25 2136 5-        5 2831 5- YES

 7 2153  +        8 2842  + YES

22 2221 3- YES   20 2845  + YES

11 2242  +       18 2921  + YES

 2 2314  + YES    3 2923 5- YES

26 2332    YES   23 3016  + YES

13 2353  + YES   10 3024 1- YES

24 2424 2- YES   21 3128  +

 6 2525  + YES   12 3212 4-

15 2615 5- YES   16 3352


                                          CUM TOTAL  26/ 51   9/ 20
```

```
  FAUBERT KEVIN              730700   SECTN  1     BURTON H                     0315
                                                        31713
          TEST ADM  2 -  3/12/74
  FRACTION CORRECT ON ALL ITEMS IS  4/26             FORM 921
  FRACTION CORRECT ON YES ITEMS IS  3/23

                                           TEST          FRN COR   FRN COR
 CN  OBJ RP INS    CN  OBJ RP INS          ADM FORM       ALL        YES

  9 2013 4- YES    14 2644 2- YES           1   931       5/25       0/ 0

 19 2024  + YES     1 2721 1- YES           2   921       4/26       3/23

  4 2063 3- YES    17 2754 5- YES

 25 2136 5-         5 2831 5- YES

  7 2153  +         8 2842  + YES

 22 2221 4- YES    20 2845  + YES

 11 2242 3-        18 2921 3- YES

  2 2314 4- YES     3 2923 3- YES

 26 2332 3- YES    23 3016 2- YES

 13 2353    YES    10 3024 2- YES

 24 2424 1- YES    21 3128 1- YES

  6 2525 2- YES    12 3212 2- YES

 15 2615 1- YES    16 3352 5- YES


                                          CUM TOTAL   9/ 51    3/ 23
```

```
BRIDEAU  ANTONIA            740110   SECTN  1     TOMLINSON B          03157
                                                     31718
        TEST ADM  2 -  3/1[illegible]
 FRACTION CORRECT ON ALL ITEMS IS 14/25             FORM 931
 FRACTION CORRECT ON YES ITEMS IS 12/21

                                          TEST          FRN COR   FRN COR
CN  OBJ RP INS     CN   OBJ RP INS        ADM  FORM      ALL       YES

 6 2014 3- YES     23 2723  + YES          1    921     10/26       0/ 0

18 2043  + YES      7 2744  + YES          2    931     14/25      12/21

10 2122  + YES     11 2835 4- YES

 2 2143  + YES      3 2843 5- YES

14 2154  +          1 2846  + YES

22 2226  + YES     25 2922  + YES

 4 2245  +          9 2935  + YES

12 2317 2- YES     17 3017  + YES

20 2333  + YES     13 3035

 8 2414 5- YES     24 3135 4- YES

16 2513 5- YES     21 3153 5- YES

19 2535            15 3223 1- YES

 5 2633  + YES     26    0


                                          CUM TOTAL  24/ 51   12/ 21
```

```
      COMPREHENSIVE ACHIEVEMENT MONITORING - TEACHER SUMMARY REPORT  317 8
CANADORE MATH MONITORING  1-3                          SECTN  1 TNB   8  TORBAY E
                                                                             03157
                                          CUM                 TEST ADMINISTRATION
NUMBER          NAME                      AVG     1   2    3    4    5    6    7    8

740400 BELL  ROBERT                 ALL    23     0  23
                                    YES     0     0   0
                                    FORM          0 921

740300 DEGAGNE  MARGARET            ALL     0     0   0
                                    YES     0     0   0
                                    FORM          0 941

740470 FIELDING  MARGARET           ALL    61     0  61
                                    YES     0     0   0
                                    FORM          0 921

740310 FLETCHER  SHIRLEY            ALL    34     0  34
                                    YES     0     0   0
                                    FORM          0 951

740500 GERVAIS  RICHARD             ALL    40     0  40
                                    YES     0     0   0
                                    FORM          0 931

740390 GREGOIRE  MARC               ALL    22     0  22
                                    YES     0     0   0
                                    FORM          0 941

740320 HARE  LILLIAN                ALL    40     0  40
                                    YES     0     0   0
                                    FORM          0 941

740460 HENDRY  RONALD               ALL    48     0  48
                                    YES     0     0   0
                                    FORM          0 931

740330 MORROW  RICHARD              ALL    19     0  19
                                    YES     0     0   0
                                    FORM          0 951

740520 PAGNINI  BILL                ALL    59     0  59
                                    YES     0     0   0
                                    FORM          0 941

740490 RESTOULE  BRENDA             ALL    61     0  61
                                    YES     0     0   0
                                    FORM          0 921

740410 RICHER  MICHAEL              ALL    40     0  40
                                    YES     0     0   0
                                    FORM          0 931

740340 SIMMS  DEBBIE                ALL     0     0
                                    YES     0     0
                                    FORM          0
```

```
 ************    **********     *         **    **********    **
************    ************    **        **   ************   **
**              **        **    ***       **   **        **   **
**              **        **    ****      **   **        **   **
**              **        **    ** **     **   **        **   **
**              ************    **  **    **   ************   **
**              ************    **   **   **   ************   **
**              **        **    **    **  **   **        **   **
**              **        **    **     ** **   **        **   **
**              **        **    **      ****   **        **   **
************    **        **    **       ***   **        **   ************
 ***********    **        **    **        **   **        **   ************

CANAL                        15/03/74 18:34:58 CANAL                      15/03
CANAL                        15/03/74 18:34:58 CANAL                      15/03
CANAL                        15/03/74 18:34:58 CANAL                      15/03
CANAL                        15/03/74 18:34:58 CANAL                      15/03
```

```
  COMPREHENSIVE ACHIEVEMENT MONITORING --- CURRICULUM ANALYSIS PROGRAM

CANADORE MATH MONITORING  1-3             31713              031574
PRELIMINARY ANALYSIS OF LEVEL 2 BASED ON TWO TEST ADMINISTRATIONS

                         FORM 221 WITH 26 QUESTIONS

     QUESTION                                                    ITEM
     POSITION    ANSWER        UNIT    LESSON    OBJECTIVE     NUMBER
         1         3            27      2720       2721        272103
         2         5            23      2310       2314        231405
         3         1            29      2920       2923        292301
         4         4            20      2060       2063        206304
         5         1            28      2830       2831        283101
         6         5            25      2520       2525        252505
         7         2            21      2150       2153        215302
         8         3            28      2840       2842        284203
         9         3            20      2010       2013        201303
        10         5            30      3020       3024        302405
        11         2            22      2240       2242        224202
        12         3            32      3210       3212        321203
        13         2            23      2350       2353        235302
        14         5            26      2640       2644        264405
        15         4            26      2610       2615        261504
        16         2            33      3350       3352        335202
        17         3            27      2750       2754        275403
        18         1            29      2920       2921        292101
        19         3            20      2020       2024        202403
        20         5            28      2840       2845        284505
        21         4            31      3120       3128        312804
        22         1            22      2220       2221        222101
        23         4            30      3010       3016        301604
        24         3            24      2420       2424        242403
        25         1            21      2130       2136        213601
        26         2            23      2330       2332        233202
```

```
 COMPREHENSIVE ACHIEVEMENT MONITORING --- CURRICULUM ANALYSIS PROGRAM

CANADORE MATH MONITORING  1-3             31718              031574
PRELIMINARY ANALYSIS OF LEVEL 2 BASED ON TWO TEST ADMINISTRATIONS

                      FORM 931 WITH 25 QUESTIONS

QUESTION                                                   ITEM
POSITION   ANSWER        UNIT    LESSON    OBJECTIVE      NUMBER
    1         2           28      2840       2846         284602
    2         5           21      2140       2143         214305
    3         2           28      2840       2843         284302
    4         2           22      2240       2245         224502
    5         5           26      2630       2633         263305
    6         1           20      2010       2014         201401
    7         5           27      2740       2744         274405
    8         2           24      2410       2414         241402
    9         3           29      2930       2935         293503
   10         4           21      2120       2122         212204
   11         1           28      2830       2835         283501
   12         3           23      2310       2317         231703
   13         4           30      3030       3035         303504
   14         4           21      2150       2154         215404
   15         2           32      3220       3223         322302
   16         1           25      2510       2513         251301
   17         3           30      3010       3017         301703
   18         1           20      2040       2043         204301
   19         4           25      2530       2535         253504
   20         5           23      2330       2333         233305
   21         1           31      3150       3153         315301
   22         3           22      2220       2226         222603
   23         4           27      2720       2723         272304
   24         5           31      3130       3135         313505
   25         3           29      2920       2922         292203
```

CANADORE MATH MONITORING 1-3   31718   031574
PRELIMINARY ANALYSIS OF LEVEL 2 BASED ON TWO TEST ADMINISTRATIONS

UNIT	OBJECTIVE	ITEM NUMBER	ANSWER	LESSON	FORM
20	2013	201303	3	2010	921
20	2014	201401	1	2010	931
20	2024	202403	3	2020	921
20	2043	204301	1	2040	931
20	2063	206304	4	2060	921
21	2122	212204	4	2120	931
21	2136	213601	1	2130	921
21	2143	214305	5	2140	931
21	2153	215302	2	2150	921
21	2154	215404	4	2150	931
22	2221	222101	1	2220	921
22	2226	222603	3	2220	931
22	2242	224202	2	2240	921
22	2245	224502	2	2240	931
23	2314	231405	5	2310	921
23	2317	231703	3	2310	931

```
 COMPREHENSIVE ACHIEVEMENT MONITORING --- CURRICULUM ANALYSIS PROGRAM

CANADORE MATH MONITORING  1-3           31718                031574
PRELIMINARY ANALYSIS OF LEVEL 2 BASED ON TWO TEST ADMINISTRATIONS

                                ITEM
        UNIT   OBJECTIVE       NUMBER    ANSWER    LESSON   FORM

          23      2332
                               233202      2        2330    921

          23      2333
                               233305      5        2330    931

          23      2353
                               235302      2        2350    921

          24      2414
                               241402      2        2410    931

          24      2424
                               242403      3        2420    921

          25      2513
                               251301      1        2510    931

          25      2525
                               252505      5        2520    921

          25      2535
                               253504      4        2530    931

          26      2615
                               261504      4        2610    921

          26      2633
                               263305      5        2630    931

          26      2644
                               264405      5        2640    921

          27      2721
                               272103      3        2720    921

          27      2723
                               272304      4        2720    931

          27      2744
                               274405      5        2740    931

          27      2754
                               275403      3        2750    921

          28      2831
                               283101      1        2830    921
```

```
  COMPREHENSIVE ACHIEVEMENT MONITORING --- CURRICULUM ANALYSIS PROGRAM

CANADORE MATH MONITORING  1-3              31718                 031574
PRELIMINARY ANALYSIS OF LEVEL 2 BASED ON TWO TEST ADMINISTRATIONS

                                   ITEM
                 UNIT  OBJECTIVE   NUMBER   ANSWER   LESSON   FORM

                   28     2835
                                  283501      1       2830    931

                   28     2842
                                  284203      3       2840    921

                   28     2843
                                  284302      2       2840    931

                   28     2845
                                  284505      5       2840    921

                   28     2846
                                  284602      2       2840    931

                   29     2921
                                  292101      1       2920    921

                   29     2922
                                  292203      3       2920    931

                   29     2923
                                  292301      1       2920    921

                   29     2935
                                  293503      3       2930    931

                   30     3016
                                  301604      4       3010    921

                   30     3017
                                  301703      3       3010    931

                   30     3024
                                  302405      5       3020    921

                   30     3035
                                  303504      4       3030    931

                   31     3128
                                  312804      4       3120    921

                   31     3135
                                  313505      5       3130    921

                   31     3153
                                  315301      1       3150    931
```

```
 COMPREHENSIVE ACHIEVEMENT MONITORING --- CURRICULUM ANALYSIS PROGRAM

CANADORE MATH MONITORING  1-3           31718           031574
PRELIMINARY ANALYSIS OF LEVEL 2 BASED ON TWO TEST ADMINISTRATIONS

                                ITEM
          UNIT  OBJECTIVE      NUMBER  ANSWER  LESSON  FORM

            32    3212
                               321203    3       3210   921

            32    3223
                               322302    2       3220   931

            33    3352
                               335202    2       3350   921
```

```
  COMPREHENSIVE ACHIEVEMENT MONITORING --- CURRICULUM ANALYSIS PROGRAM

 CANADORE MATH MONITORING  1-3          31718          031574
 PRELIMINARY ANALYSIS OF LEVEL 2 BASED ON TWO TEST ADMINISTRATIONS
          21

           ITEM      COR             TOT    AVG              RESPONSES (%)
          NUMBER     ANS            RESP   SCOR       NR    1    2    3    4    5

          212204      4               24     91        0    8    0    0   91    0
      2122                            24     91

          213601      1               24     12        8   12   16    0   33   29
      2136                            24     12

          214305      5               24     58        0    0   25    0   16   58
      2143                            24     58

          215302      2               24     54        8    0   54   12   16    8
      2153                            24     54

          215404      4               24     33        8    4    4    4   33   45
      2154                            24     33



SUMMARY DATA FOR
            21
                                     120     50
  COMPREHENSIVE ACHIEVEMENT MONITORING --- CURRICULUM ANALYSIS PROGRAM

  CANADORE MATH MONITORING  1-3              31719              031574
  PRELIMINARY ANALYSIS OF LEVEL 2 BASED ON TWO TEST ADMINISTRATIONS
   Block.   20

               ITEM       COR           TOT    AVG             RESPONSES (%)
              NUMBER      ANS           RESP   SCOR     NR    1    2    3    4    5

              201303       3             24     41       0    4   16   41    8   29
        2013                             24     41

              201401       1             24     41       0   41    8   25   16    8
        2014                             24     41

              202403       3             24     87       4    0    0   87    0    8
        2024                             24     87

              204301       1             24     87       0   87    0    4    3    0
        2043                             24     87

              206304       4             24     12       0    0    4    4   12   79
        2063                             24     12


SUMMARY DATA FOR
               20
                                        120     54
   COMPREHENSIVE ACHIEVEMENT MONITORING --- CURRICULUM ANALYSIS PROGRAM

  CANADOPE MATH MONITORING  1-3              31718              031574
  PRELIMINARY ANALYSIS OF LEVEL 2 BASED ON TWO TEST ADMINISTRATIONS
            20

PRE = -999 TO    -1 DAYS    POST =     0 TO    14 DAYS    RETN =    15 TO   999 D

                                   TOT    AVG
                                  RESP   SCOR

        2013            PRE          5     40
                       POST          2    100
                       RETN         17     35
                      NO GAIN POST COMPUTED
                      NO GAIN RETN COMPUTED

        2014            PRE          4     50
                       POST          2      0
                       RETN         18     44
                      NO GAIN POST COMPUTED
                      NO GAIN RETN COMPUTED

        2024            PRE          5    100
                       POST          2    100
                       RETN         17     82
                      NO GAIN POST COMPUTED
                      NO GAIN RETN COMPUTED

        2043            PRE          4    100
                       POST          2    100
                       RETN         18     83
                      NO GAIN POST COMPUTED
                      NO GAIN RETN COMPUTED

        2063            PRE          5     20
                       POST          2     50
                       RETN         17      5
                      NO GAIN POST COMPUTED
                      NO GAIN RETN COMPUTED


SUMMARY DATA FOR
        20
                        PRE         23     60
                       POST         10     70
                       RETN         87     50
                      GAIN POST =   10%
                      GAIN RETN =   10%
```

```
     COMPREHENSIVE ACHIEVEMENT MONITORING --- CURRICULUM ANALYSIS PROGRAM

    CANADORE MATH MONITORING  1-3            31718            031574
    PRELIMINARY ANALYSIS OF LEVEL 2 BASED ON TWO TEST ADMINISTRATIONS
              21

PRE = -999 TO    -1 DAYS    POST =     0 TO   14 DAYS    RETN =   15 TO  999

                               TOT   AVG
                              RESP  SCOR

       2122             PRE      4   100
                       POST      2   100
                       RETN     18    88
                      NO GAIN POST COMPUTED
                      NO GAIN RETN COMPUTED

       2136             PRE     24    12
                       POST      0     0
                       RETN      0     0
                      NO GAIN POST COMPUTED
                      NO.GAIN RETN COMPUTED

       2143             PRE      4    75
                       POST      2   100
                       RETN     18    50
                      NO GAIN POST COMPUTED
                      NO GAIN RETN COMPUTED

       2153             PRE     24    54
                       POST      0     0
                       RETN      0     0
                      NO GAIN POST COMPUTED
                      NO GAIN RETN COMPUTED

       2154             PRE     24    33
                       POST      0     0
                       RETN      0     0
                      NO GAIN POST COMPUTED
                      NO GAIN RETN COMPUTED


SUMMARY DATA FOR
       21
                        PRE     80    38
                       POST      4   100
                       RETN     36    69
                      NO GAIN POST COMPUTED
                      GAIN RETN =  31%
```

APPENDIX "D-12"

STUDENT MANAGEMENT FOLDERS AND EXAMPLES

Canadore College

CAM 3

Mathematics Task and Resource Index

ourse ____________

evel 2

ock 20 Whole Numbers

Task Completed
Mo. Da. Yr.

Unit 1 1. Identify a whole number in Hindu-Arabic notation when given it orally (numbers up to 1,000 and more). ☐☐☐

2. Name the place value of digits in a whole number.

3. Re-arrange a series of whole numbers from smaller numbers up to millions, or visa versa.

4. Round off whole numbers less than 100,000 to designated accuracy.

Unit 2 1. Identify the proper application of the associative property of addition. ☐☐☐

2. Identify the proper application of the commutative property of addition.

3. Identify the proper application of the additive identity.

4. Calculate the sum of two or more whole numbers (sum $>$ 1,000).

Unit 3 1. Identify the sum of an addition problem involving no more than four whole numbers. ☐☐☐

2. Select the arithmetic expression that is sufficient to solve the problem of adding no more than four whole numbers (sum $>$ 100).

3. Solve word problems involving adding of no more than four whole numbers (sum $>$ 100).

Unit 4 1. Find the difference between two whole numbers on the number line. ☐☐☐

2. Find the difference between whole numbers that do not require borrowing in subtraction.

CAM I.D. NUMBER ☐☐☐☐☐☐

Canadore College

CAM 3

Mathematics Task and Resource Index

ourse ____________

evel ______2______

lock ______20______ Whole Numbers

Task Completed
Mo. Da. Yr.

Unit 4
3. Find the difference between two or more whole numbers that require borrowing in subtraction.
4. Check the subtraction problem by adding.

Unit 5
1. Identify a minuend. ☐☐☐
2. Identify a subtrahend.
3. Identify a difference between two numbers.

Unit 6
1. Find the difference between no more than four whole numbers. ☐☐☐
2. Select the expression necessary to find the difference between no more than four whole numbers given in a word problem.
3. Identify the difference between no more than four whole numbers given in a word problem.

AME ______________________________ CAM I.D. NUMBER ☐☐☐☐☐☐

source Index

PRINT MATERIAL	UNIT			
	1	2	3	4
Arithmetic Readiness				
Lennes Essentials of Arithmetic			1)21,23	5) 11
Check and Double Check	5)1,14-17	4)21,23	4)22,5)42	4)23,54,55
Primary Math Program				
Interm. Math Program	tape 2			tape 7
Adult Basic Ed. Arithmetic	3) 30,31	3)10,11	3)11,12	
Basic Arithmetic	1-9	11,12,15		21-25
Basic Mathematics	1-15	31-44	15	81,82,84,
Fractions I			31-45	
General Mathematics		26		
Learning to Compute		1)2,3,6	1)6,2)4,5	1)23,2)19,
Math: A Basic Course	2,3,5-7		8,9	10,11
Refresher Mathematics		5,6,8,26,	26,27,32-	35,37-40
Understanding Metric System				
Intro. to Modern Mathematics		1) 31-49		
Arithmetic of the Whole Number				
Whole Number and Numerals (Supp.)				
Introduction to Math	1) 3-41	1) 42-67		
Inter. Technical Math				
Practical Math				
Gage Math				
Basic Math	1) 1-26	1) 27-93		
Preparing for Algebra				

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PRINT MATERIAL	UNIT			
	5	6	7	8
Arithmetic Readiness				
Lennes Essentials of Arithmetic		4) 15,17		
Check and Double Check	5) 53	4)14,23		
Primary Math Program				
Interm. Math Program				
Adult Basic Ed. Arithmetic		3)15,81		
Basic Arithmetic	27	27		
Basic Mathematics		89,91,93-		
Fractions I				
General Mathematics				
Learning to Compute		1)23-26,28		
Math: A Basic Course		11		
Refresher Mathematics		37-40		
Understanding Metric System				
Intro. to Modern Mathematics		1)94-113		
Arithmetic of the Whole Number				
Whole Number and Numerals (Supp.)				
Introduction to Math		1)68-81		
Inter. Technical Math				
Practical Math				
Gage Math				
Basic Math		1)97-140		
Preparing for Algebra				

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FILMS AND VIDEO CASSETTES

	UNIT			
	1	2	3	4
How to Change Fractions				
How to Multiply Fractions				
How to Add Fractions				
How to Subtract Fractions				
Percentage Revised				
The Concept of Fractional Numbers				
Addition of Fractional Numbers				
Place Value	X			
Fractional Parts				
Models: When to multiply or divide				
When to add or subtract		X		X
Division of Fractional Numbers				
Multiplication of Fractional Numbers				
Subtraction of Fractional Numbers				

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FILMS AND VIDEO CASSETTES

	UNIT			
	5	6	7	8
How to Change Fractions				
How to Multiply Fractions				
How to Add Fractions				
How to Subtract Fractions				
Percentage Revised				
The Concept of Fractional Numbers				
Addition of Fractional Numbers				
Place Value				
Fractional Parts				
Models: When to multiply or divide				
When to add or subtract				
Division of Fractional Numbers				
Multiplication of Fractional Numbers				
Subtraction of Fractional Numbers				

Resource Index

AUDIO TAPES

			UNIT			
			1	2	3	4
		Basic Mathematics Set II				

AUDIO TAPES

		UNIT			
		5	6	7	8
	Basic Mathematics Set II				

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FILMSTRIPS	UNIT			
	1	2	3	4
Distance and Betweens				
Meaning and Reading of Decimals				
Addition and Subtraction of Decimals				
Multiplication of Decimals				
Division of Decimals				
Changing Fractions to Decimals				
Advancing in Linear Measurements				
Advancing in Quantity Measurements				
Names of Numbers	x			
Adding with Fractions				
Number and Numerical	X			
Place Value and Subtraction				X
Multiplication with Fractions				
Division by Fractional Numbers				
Operations with Fractions				
Our Decimal Number System				
Operations with Decimals				
Percents				
Metric System				
Areas of Triangular Regions				
Where Fractions Come From				
Naming Fractions				
Multiplication of Fractions				
Equivalent Fractions				
Where Fractions Come From				
Naming Fractions				
Multiplication of Fractions				
Equivalent Fractions				

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FILMSTRIPS	UNIT			
	5	6	7	8
Distance and Betweens				
Meaning and Reading of Decimals				
Addition and Subtraction of Decimals				
Multiplication of Decimals				
Division of Decimals				
Changing Fractions to Decimals				
Advancing in Linear Measurements				
Advancing in Quantity Measurements				
Names of Numbers				
Adding with Fractions				
Number and Numerical				
Place Value and Subtraction				
Multiplication with Fractions				
Division by Fractional Numbers				
Operation with Fractions				
Our Decimal Number System				
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Percents				
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Areas of Triangular Regions				
Where Fractions Come From				
Naming Fractions				
Multiplication of Fractions				
Equivalent Fractions				
Where Fractions Come From				
Naming Fractions				
Multiplication of Fractions				
Equivalent Fractions				